Fishery Data Series No. 91-60

Evaluation of the Stocking of Mixed Species of Game Fish in Small Lakes

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ABSTRACT

Forty-four small lakes, ponds, and gravel pits in the Tanana Valley near Fairbanks and Delta Junction and three small lakes in the Matanuska and Susitna valleys near Palmer and Sutton were stocked with game fish over several years. In some cases, single species were stocked in a given year and in other cases, two, three, or four species of game fish in combination were stocked in a given year. Species stocked were Arctic char *Salvelinus alpinus*, Arctic grayling *Thymallus arcticus*, chinook salmon *Oncorhynchus tshawytscha*, coho salmon *Oncorhynchus kisutch*, lake trout *Salvelinus namaycush*, and rainbow trout *Oncorhynchus mykiss*. Evaluations based upon mark-recapture experiments were conducted for 113 annual stockings in the 47 study waters. Evaluations were based upon density, average fork length and species diversity of stocked fish at age 1. Densities of age 1 game fish from 52 single species stockings ranged from 0 to 730 fish per hectare. Densities of age 1 game fish from 61 mixed species stockings ranged from 0 to 661 fish per hectare. Fourteen of the 52 single species stockings failed to meet the pre-established fishery management criteria concerning minimum density of age 1 game fish population. Fourteen of the 61 mixed species stockings similarly failed to meet this criteria. Of the remaining 47 mixed species stockings, 19 achieved species diversity criteria; 28 failed to meet diversity criteria. Seventeen of the mixed species stockings resulted in age 1 game fish populations that were considered to be adequately abundant (two fish per hectare or more), large (mean length 100 millimeters or larger), and diverse (each species represented at least 10 percent of the overall stocked game fish population) to serve as an attractant to sport fishermen. Two of the 19 otherwise successful stockings produced age 1 game fish populations with a mean length under 100 millimeters. None of the 15 stockings involving three or four species fully met all three fishery management criteria, and it is recommended that future mixed species stockings be limited to two species. Nineteen of the 46 cases when exactly two species were stocked in combination achieved minimum density and species diversity criteria; species combinations that appear most promising for future stocking of small lakes, ponds, and gravel pits in interior Alaska are: (1) Arctic grayling stocked with rainbow trout; (2) coho salmon stocked with rainbow trout; (3) Arctic char stocked with rainbow trout; (4) lake trout stocked with rainbow trout; and, (5) Arctic char stocked with Arctic grayling. The proportions of single species and mixed species stockings that produced sparse, medium, and dense populations of age 1 game fish were not statistically different indicating that the major benefit resulting from annual mixed species stockings of specific waters was an increase in diversity of available game fish rather than an increase in the number of available game fish.

KEY WORDS: Arctic char, Arctic grayling, chinook salmon, coho salmon, lake trout, rainbow trout, *Salvelinus alpinus*, *Thymallus arcticus*, *Oncorhynchus tshawytscha*, *Oncorhynchus kisutch*, *Salvelinus namaycush*, *Oncorhynchus mykiss*, enhancement, stocking evaluation, stocking strategy, mixed species stocking, management of small lakes, fishery management criteria, abundance, fish density, species diversity, growth rates, sympatry.

INTRODUCTION

The Tanana Valley sport fishery increased from a level of about 100,000 man-days annually during the late 1970's to a level of almost 200,000 man-days per year during the late 1980's (Mills 1990). As the Tanana Valley sport fishery expanded, it also evolved, changing from a fishery being primarily dependent upon riverine populations of wild fish to a fishery dependent primarily upon stocked salmonids in a few large lakes and to a lesser extent, the stocking of salmonids in a multitude of small lakes, ponds, and gravel pits.

Angler surveys conducted during the 1980's (Holmes 1987; Viavant and Clark 1990) discerned that stocking more fish and stocking new species of fish were two of the most popular management options repeatedly recommended by resident Tanana Valley anglers. Although Arctic grayling *Thymallus arcticus*, chinook salmon *Oncorhynchus tshawytscha*, coho salmon *Oncorhynchus kisutch*, and rainbow trout *Oncorhynchus mykiss* have been available for stocking in the Tanana Valley for decades, it was not until the late 1980's that Arctic char *Salvelinus alpinus* and lake trout *Salvelinus namaycush* became readily available from Clear Hatchery for use as an additional management tool to meet the growing public challenge of providing a more diversified recreational fishery heavily dependent upon stocked game fish.

To increase the diversity of fish available to anglers in lakes, ponds, and abandoned gravel pits of interior Alaska, the Department of Fish and Game (ADFG) has been experimenting with the stocking of mixed species of game fish. Although as Borgeson (1966) states "variety enhances angler satisfaction", competition for food, space, and other necessities by additional species of stocked fish has the added potential to negatively impact success of any particular fishery program. The past practise of stocking rainbow trout and coho salmon in Birch and Quartz lakes in the Tanana Valley has been successful; rainbow trout support much of the open water fishery and coho salmon support much of the ice fishery in these two large lakes. Success of this aspect of the Tanana Valley stocking program implies that it is likely that other combinations of game fish stocked in sympatry may be advantageous over single species stocking programs in interior Alaska. Some of the potential advantages of stocking more than one species in a particular water body are better utilization of lake resources, greater species diversity, and increased biomass of game fish. Mixed species stocking of individual water bodies may increase the recreational potential and actual angler use of these fishing waters. Another important but indirect potential benefit is conservation of indigenous stocks by diverting additional fishing effort to waters stocked with diverse game fish. On the other hand, inter-species competition may decrease growth and survival of one or more of the stocked species eventually leading to a fishery that is less attractive to anglers than it would have been if it were stocked with only a single species.

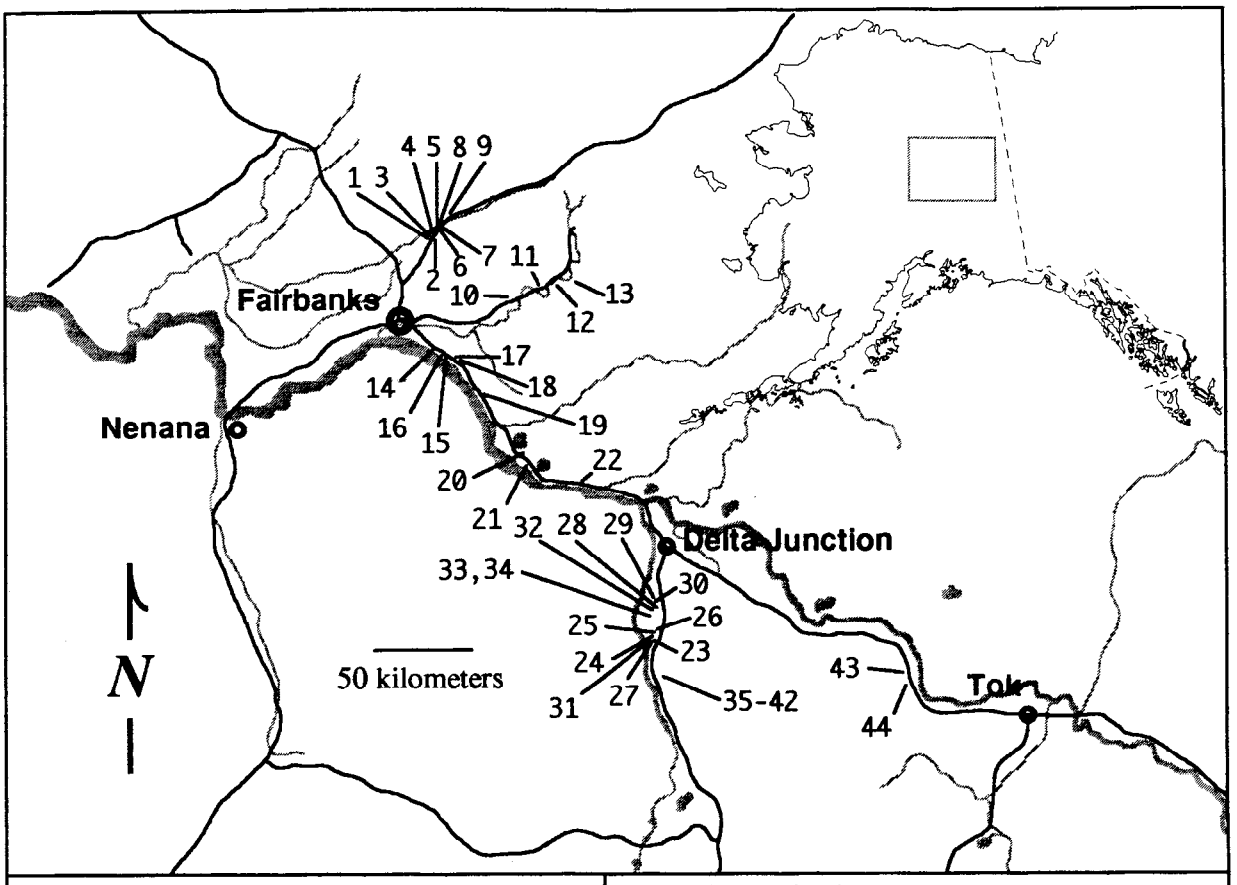
Past researchers have shown that various species of fish are able to adapt to different environments by shifting their niche through interactive segregation. Cutthroat trout *Oncorhynchus clarki* in reservoirs coexist with various other species by modifying their adaptive response to different situations and species assemblages (Sekulich 1974). Threespine stickleback *Gasterosteus aculeatus* and juvenile sockeye salmon *Oncorhynchus nerka* have

overlapping diets, but can coexist; and when they do coexist, they inhabit different areas of a lake (Manzer 1976). In British Columbia, knowledge of species ecology and the receiving waters are used by fishery managers to stock mixed species such as rainbow trout and brook trout *Salvelinus fontinalis* (Northcote 1970).

According to MacArthur (1972), as the number of potentially competing species increases, the habitat used by a species contracts but the range of resources utilized within the habitat remains constant or increases; and, as a result, the biomass of the ecosystem as a whole will typically increase. Nilsson (1967) stated that a species with a broad ecological potential is forced to exploit a smaller, but more specific, share of resources when in sympatry, thus allowing more complete utilization of available resources by all species. Nilsson (1967) goes on to suggest that in temperate regions, available niches are best filled by only two species. MacArthur (1972) believes that when several species are involved, "diffuse competition" takes place which will eliminate some of the competing species. The game fish community in a lake represent but one portion of the overall biomass and an increase in species diversity through stocking could potentially increase or decrease overall game fish productivity through alteration of various species interactions. Further, and as Sekulich (1974) points out, one of the most difficult problems confronting a fishery manager, when introducing a species of fish as a means of increasing game fish diversity and biomass, is some basis for predicting success. Sekulich (1974) hypothesized that high productivity of the lake and a low or intermediate degree of sympatry will improve success when fishery managers stock combinations of brook, rainbow, and cutthroat trout.

Forty seven small ponds, lakes, and gravel pits (Figure 1) were selected as water bodies to research the performance of stocked cohorts of Arctic char (AC), Arctic grayling (AG), chinook salmon (KS), coho salmon (SS), lake trout (LT), and rainbow trout (RT) when stocked singly or in combination. These specific water bodies were selected because they are small, have easy access, are easy to sample, and represent a spectrum of physical and biological factors. Surface area of these water bodies range from less than 1 to more than 40 ha (most are less than 10 ha). All of these water bodies are reasonably easy to access from the road system. Some of the lakes were stocked with game fish such as Arctic grayling or rainbow trout prior to the start of this experiment. Some of these water bodies support other fish species such as burbot *Lota lota*, northern pike *Esox lucius*, lake chub *Couesius plumbeus*, longnose sucker *Catostomus catostomus*, slimy sculpin *Cottus cognatus*, humpback whitefish *Coregonus pidschian*, or round whitefish *Prosopium cylindraceum*. A description of each of the 47 study sites and details of the historical and contemporary stocking program is provided in later sections of this report. Each of these 47 water bodies was stocked with one or more of the six study species. During the open water season, mark-recapture experiments were conducted to estimate abundance, density, and mean length of the surviving stocked fish at age 1.

The overall goal of this experimental stocking program was to lay the basis for determining whether or not mixed species stocking was advantageous over single species stocking and if so, to determine which mixed species stocking combinations would potentially result in game fish communities most amenable



1 Steese Highway 29.5 Mile	23 Nickel Lake
2 Steese Highway 30.6 Mile	24 Rock Hound Lake
3 Steese Highway 31.6 Mile	25 No Mercy Lake
4 Steese Highway 33.0 Mile	26 Doc Lake
5 Steese Highway 33.5 Mile	27 Chet Lake
6 Steese Highway 34.6 Mile	28 Luke Lake
7 Steese Highway 35.8 Mile	29 Sheefish Lake
8 Steese Highway 36.6 Mile	30 Bullwinkle Lake
9 Steese Highway 39.3 Mile	31 Ghost Lake
10 Chena Hot Springs Road 32.9 Mile	32 Bolio Lake
11 Chena Hot Springs Road 42.8 Mile	33 North Twin Lake
12 Chena Hot Springs Road 45.5 Mile	34 South Twin Lake
13 Chena Hot Springs Road 47.9 Mile	35 Coal Mine Road Number 5
14 Bathing Beauty Pond	36 Ken's Pond
15 Grayling Lake	37 Backdown Lake
16 Hidden Lake	38 Brodie Lake
17 Richardson Highway 28 Mile Pit	39 Last Lake
18 Richardson Highway 31 Mile Pit	40 Paul's Pond
19 Johnson Road Number 1 Pit	41 Rangeview Lake
20 Little Harding Lake	42 Dick's Pond
21 Lost Lake	43 Jan Lake
22 Silver Fox Pit	44 Robertson Lake Number 2

Figure 1a. Location of lakes in the TananaValley.

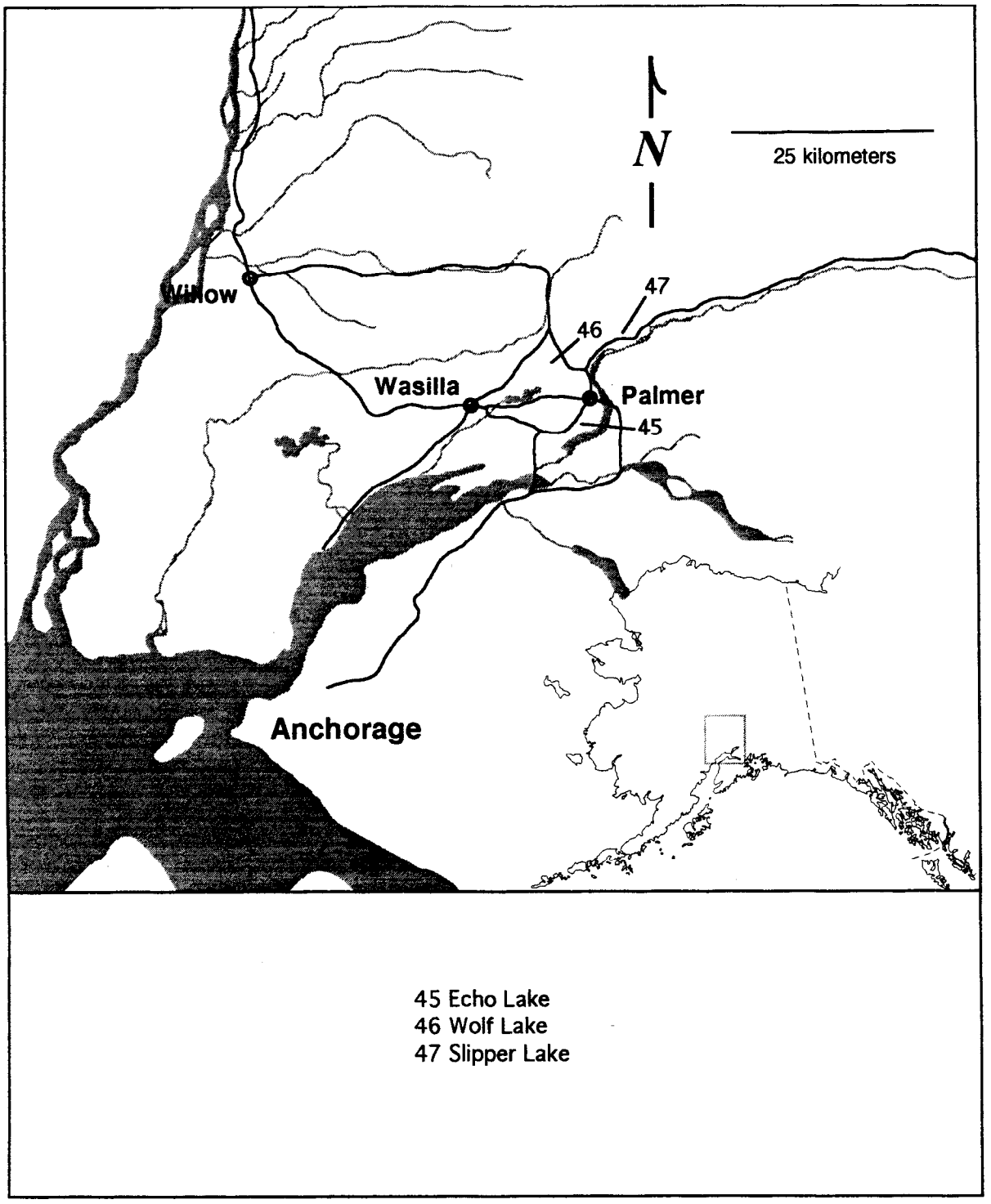


Figure 1b. Location of lakes in the Matanuska - Susitna Valley.

to supporting sport fisheries. A two year field research study was initiated to evaluate utility of the mixed species stocking experiment. The specific objective of the study in 1989 (Project F-10-5, Study T-8-1) was to estimate the abundance of Arctic char and lake trout that were stocked in numerous lakes in interior Alaska in 1988. The specific objective of the study in 1990 (Project F-10-6 Study E-3-1a) was to estimate the abundance, cohort composition, and mean length of each cohort for populations of rainbow trout, coho salmon, Arctic char, lake trout, and Arctic grayling that were stocked in 30 small lakes in the Tanana Valley in 1989.

The purpose of this report is to provide summary information concerning this overall research program and to satisfy reporting requirements for Federal Aid in Fish Restoration Act Contract Numbers F-10-5; Study T-8-1 and F-10-6; Study E-3-1a. Because of the extensive amounts of data collected through this study, the numerous and diverse water bodies studied (47), and the numerous fish populations and stocking cohorts studied (113), most of this report will concentrate upon basic data collected and upon basic fishery statistics such as number of fish stocked, number of fish surviving to age 1, their mean length, and the relative success of these various game fish introductions. It is anticipated that further and more detailed analyses of data presented in this report will occur and be presented in future technical report(s).

METHODS

Stocking

During the late 1980's, Arctic char, Arctic grayling, chinook salmon, coho salmon, lake trout, and rainbow trout were stocked into 44 small lakes, ponds, and abandoned gravel pits in the Tanana Valley. Stockings of mixed species of game fish into three lakes of the Matanuska and Susitna valleys were also evaluated, bringing the total number of study sites to 47. Specific species were stocked into specific study waters based upon: (1) past history of stocking in the water body (what was already present); (2) what was available from the State hatchery system (numbers of these six species available for stocking); (3) logistical difficulty of stocking fish into specific waters (overall transportation distance and access difficulties at specific stocking locations); and, when possible given items 1 through 3 above, (4) through the use of a random number table. Attempts were made to annually stock various multiple species combinations (Figure 2) into each of several of these water bodies. In some lakes, only single species stocking occurred. Typically, fingerling sized fish were stocked with a mean weight ranging from 1 to 8 g, depending on species and date of stocking, although exceptions occurred such as the occasional stocking of sub-catchable sized fish averaging about 20 g. Almost all fish were stocked at age 0; a few age 1 fish were stocked. Most of the lakes had been stocked previously with various species of game fish. Specifics concerning the stocking of fish into each of the 47 study waters are included in the results section of this report.

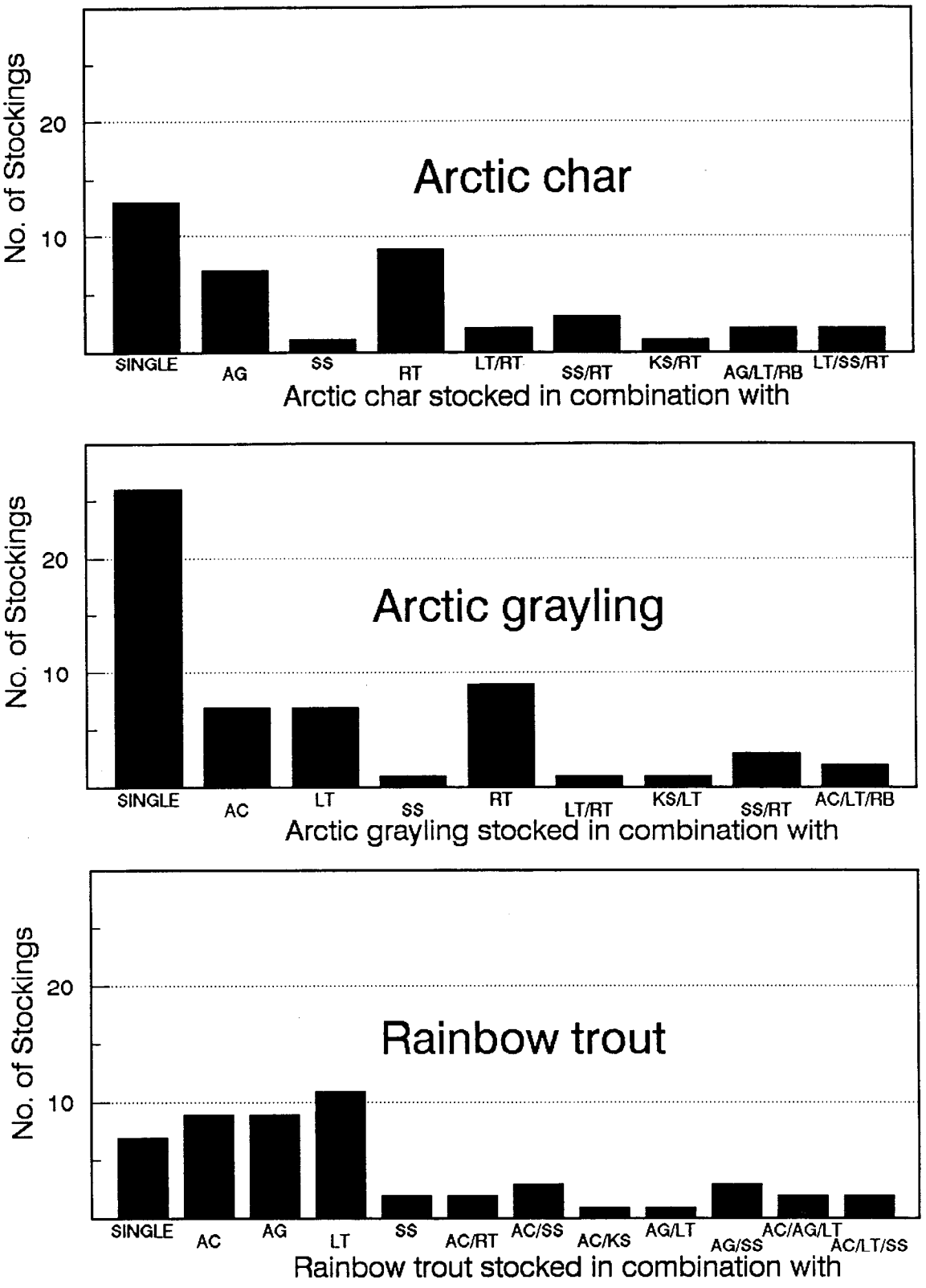
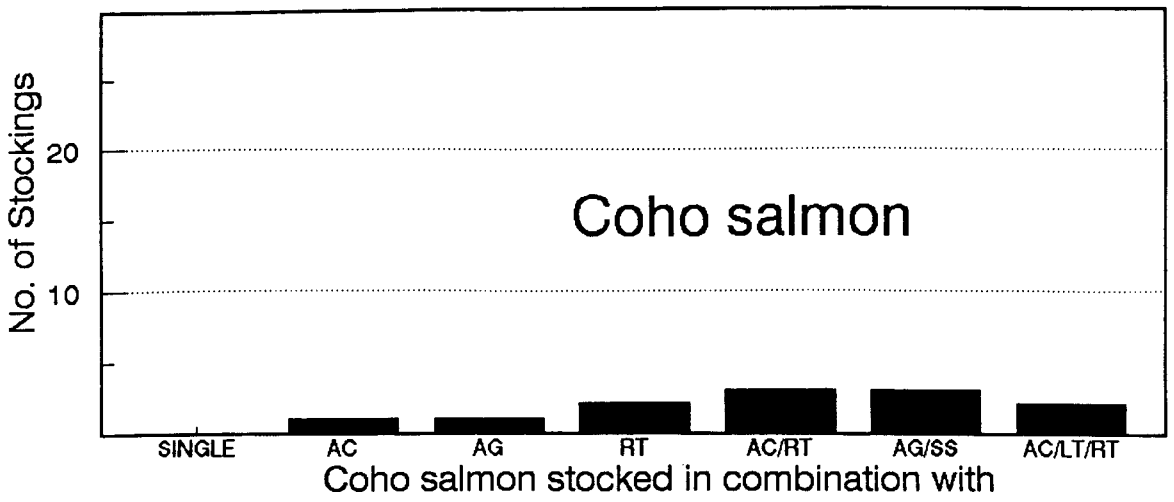
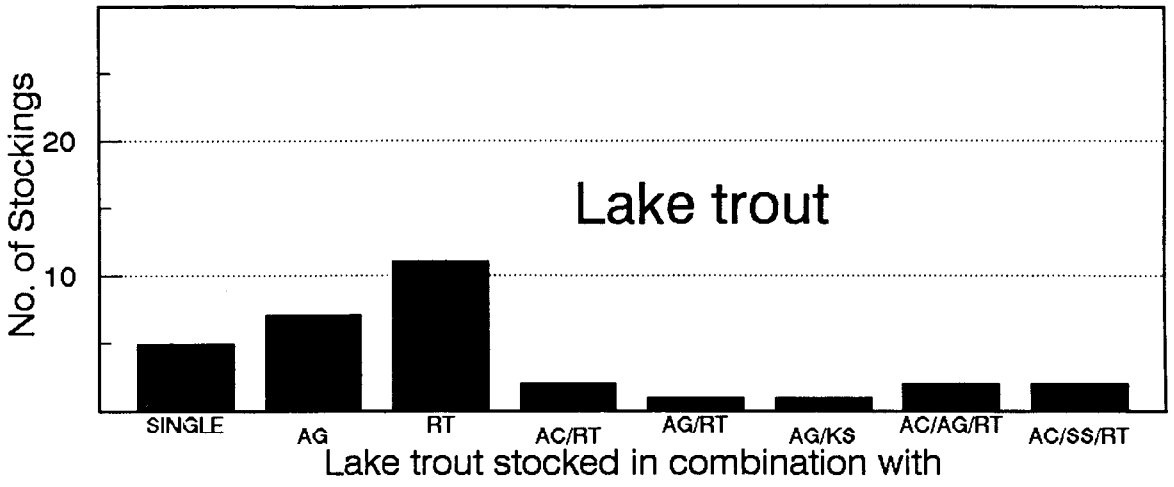


Figure 2. Number of stocking evaluations by species combination.





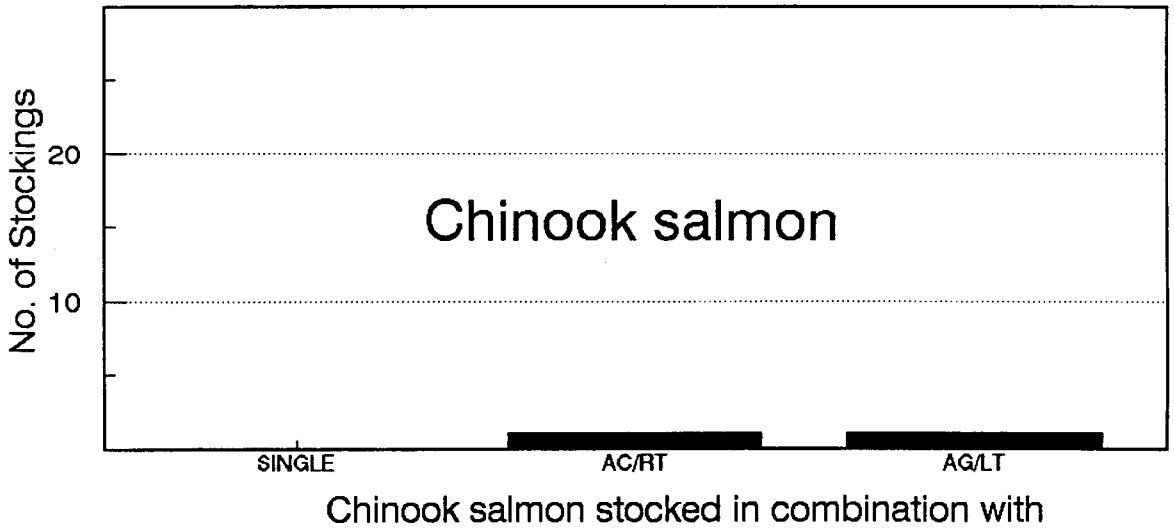


Figure 2. (Page 2 of 2).

Mark-Recapture Experiments

In 1989 and 1990 (and prior to 1989 for some water bodies), mark-recapture experiments were conducted to estimate abundance of the stocked species at age 1. During these mark-recapture experiments, fish were captured with fyke nets. Three fyke nets were used in smaller lakes and up to six fyke nets were used in larger lakes. Fish were captured for marking in May, June, and July and were captured again in August, September, and October for examination of the marked to unmarked ratio. All fish were marked in 1989 by removing the upper lobe of the caudal fin and in 1990 by removing the right pelvic fin near the base. All fish were measured from the tip-of-snout to the fork-of-tail to the nearest millimeter to determine fork length (FL). For each species, the numbers of age 1 versus age 2+ (age 2 and older) fish captured in the field sampling program were determined through examination of length frequency distributions. With this method, mean lengths of age 1 fish were likely biased low and mean lengths of age 2+ fish were likely biased high to an unknown degree.

For each species, the abundance of each age group was estimated using the Petersen method (modified by Chapman 1951) for a closed population. The abundance, N, at the time of marking was estimated by:

$$\hat{N} = \frac{(n_1+1)(n_2+1)}{(m+1)} - 1 \quad \text{and} \qquad (1)$$

$$\hat{V}(N) = \frac{(n_1+1)(n_2+1)(n_1-m)(n_2-m)}{(m+1)^2(m+2)} - 1 \; ; \qquad (2)$$

where:

$\hat{N}$ = abundance estimate;

n_1 = number of fish in the 1st sample (number marked);

n_2 = number of fish in the 2nd sample (number of marked and unmarked); and,

m_2 = number of marked fish in n_2.

When conducting two-event mark-recapture experiments on closed populations, the following two assumptions must be fulfilled for the estimates to be unbiased:

1. catching and handling the fish does not affect the probability of recapture; and,

2. marked fish do not lose their mark.

Additionally, of the following three assumptions, only one must be fulfilled:

3. every fish has an equal probability of being captured during the first event;

4. every fish has an equal probability of being captured during the second event that occurred during August, September, and October; or,

5. marked fish mix completely with unmarked fish between the first and second sampling events.

To reduce the failure of assumption 1, fish injured during capture and marking were not marked or were not returned to the population which reduced the chance of marked fish having a higher mortality rate than unmarked fish. To reduce the failure of assumption 2, fish were marked with fin clips that were unlikely to be lost or unrecognized. Fish marked by removing a portion of the caudal fin usually regenerate the fin. However, there is a noticeable change in the direction of the rays from the nonclipped portion of the fin to the regenerated portion. When pelvic fins are removed near the base there is very little regeneration.

For assumptions 3, 4, and 5, the design of the experiment and behavior of the species under study reduced the chance of failure of these assumptions. Potential bias due to an unequal probability of capture and size selectivity of gear was evaluated with Chi-square statistics for each mark-recapture experiment. In most cases the Chi-square tests were not significant. In the few cases where tests were significant, stratified estimates of abundance were not substantially different from unstratified estimates and only the unstratified estimates are reported in order to simplify the presentation of the hundreds of population estimates summarized in this report. The lack of an outlet or inlet in most of the study lakes closed the populations to recruitment or migration. The small size of each lake and the length of time between the first and second events (more than one month) promotes mixing of marked and unmarked fish. Natural mortality is not a problem when mortality rates are similar for marked and unmarked fish. However, mortality (natural or fishing) is a problem when rates are dissimilar for different age groups. Because fish used in this study begin to recruit to the fishery by age 2, the abundance of fish older than age 1 was estimated as a group separately from those for age 1.

Densities of age 1 game fish populations were estimated by dividing the number of age 1 fish of a particular species by the surface area in hectares of that water body.

The survival rate to age 1 was calculated as follows:

$$\hat{S} = \frac{\hat{N}}{M} \quad \text{and} \qquad (3)$$

$$\hat{V}[\hat{S}] = \frac{\hat{V}[\hat{N}]}{M^2} \quad ; \tag{4}$$

where:

$\hat{S}$ = the estimated survival rate; and,

M = the number of fish stocked in lake.

Mean Length Calculations

All fish captured during mark-recapture experiments were measured to determine fork length. For each species, the mean length of age 1 fish as well as the mean length of fish older than age 1 was calculated as follows:

$$\bar{x} = \frac{\Sigma x_i}{n} \quad \text{and} \tag{5}$$

$$\hat{V}[\bar{x}] = (1 - f)\frac{\Sigma (x_i - \bar{x})^2}{n (n - 1)} \quad ; \tag{6}$$

where:

x_i = an individual length measurement;

$\bar{x}$ = the average length of the sample;

n = the sample size; and,

f = the finite population correction factor $\frac{(n_1 + n_2 - m)}{\hat{N}}$.

The variance of $\bar{x}$ is a minimum because of the truncated length distribution of fish of a given age due to use of the length frequency method.

Lake and Location Measurements

A generalized morphoedaphic index (MEI) was calculated for many of the study lakes as follows:

$$MEI = \frac{A}{\bar{z}} \quad ; \tag{7}$$

where:

MEI = the morphoedaphic index of the lake;
A = the total alkalinity (mg/L as $CaCO_3$) of the lake; and,
$\bar{z}$ = the mean depth of the lake.

Most of the listed morphoedaphic indexes were obtained from recent measurements (Skaugstad 1989). When recent measurements were not available morphoedaphic indexes were obtained from available records at ADFG offices in Fairbanks and Palmer. Listings of MEIs for lakes in this report are provided as background information.

Names and locations of several lakes in this report use Mile Posts. Mile Posts are structures that are located at one mile intervals along most Alaskan Highways to aid travelers in determining their location. Kilometers as a distance measurement are used in this report to describe distances between locations.

Fishery Management Criteria

Three fishery management criteria were established prior to data analysis to make determinations (or judgements) as to the success or lack of success for each of the stockings for each of the study sites. Although arbitrary decisions were made in order to define these three fishery management criteria, the criteria are thought to be realistic in terms of delineating the minimum density of game fish needed to attract anglers, the minimum length at age 1 needed for stocked game fish to reach catchable size the second year after being stocked, and the minimum proportions of each species in the population needed for species diversity to be an added attractant to anglers. After these criteria were established, the annual stocking program for each study site was judged on the following rationale with data collected from the sampling program:

1. Overall Stocking Success:
   - Failure: Density of age 1 stocked game fish population less than two fish per ha.
   - Moderately Successful: Density of age 1 stocked game fish population between two and 20 fish per ha.
   - Fully Successful: Density of age 1 stocked game fish population more than 20 fish per ha.

2. Growth of Stocked Fish:
   - Not Applicable (N.A.): Stocking judged to have been a failure due to density being less than two fish per ha.
   - Growth Rate Inadequate: mean fork length of stocked cohort at age 1 less than 100 mm.
   - Growth Rate Adequate: Mean fork length of stocked cohort at age 1 100 mm or more.

3. Diversity Achieved Through Mixed Stocking:
   - Not Applicable: Stocking judged to have been a failure due to density being less than two fish per ha, and/or, only one species stocked in a given year.
   - Diversity Inadequate: At least one of the stocked species in a given year represents less than 10% of the overall abundance of age 1 stocked fish.

Diversity Adequate: Each species stocked in a given year represents 10% or more of the overall abundance of age 1 stocked fish.

Comparison of Densities of Single Species Versus Mixed Species Stockings

A contingency table was used to compare the total number of age 1 game fish per ha resulting from single species and mixed species stockings. The contingency table was created by first ordering densities of age 1 fish resulting from the 52 stockings of single species from the least to the most age 1 fish per hectare. The stockings were grouped into those that fell below the 25th percentile, between the 25th and 75th percentile, and above the 75th percentile. The number of single species stockings included in each of three density categories (low, middle, and high) was counted. The mean density of age 1 fish resulting from single species stockings calculated from the most dense population in the lower 25th percentile and the least dense population between the 25th and 75th percentile was calculated and used to establish a low density criteria for evaluation of mixed species stockings. The mean density of age 1 fish resulting from single species stockings calculated from the least dense population in the upper 75th percentile and the most dense population between the 25th and 75th percentile was calculated and used to establish a high density criteria for evaluation of mixed species stockings. Next, the 61 mixed species stockings were placed into three categories: (1) low density; (2) middle density; and, (3) high density groups based upon these two calculated values, and the number of stockings in each of the three groups was counted. These counts of single species and mixed species stockings falling into the low, middle, and high density categories were used in a contingency table which was evaluated with the Chi-square statistic. The null hypothesis was that the proportions of single species and mixed species stockings falling into these three categories were not different. A similar Chi-square test was conducted wherein the mixed species portion of the analysis consisted of only those cases where two species were used.

RESULTS AND DISCUSSION

Lake by Lake Stocking Evaluations

Forty-seven lakes were used as study sites to evaluate the success of single and mixed species stockings of game fish. Specifics concerning lake characteristics, stocking history, recent fishery statistics, and whether or not these various stockings achieved established evaluation criteria are presented below on a study site by study site basis.

Steese Highway 29.5 Mile Pit:

Steese Highway 29.5 Mile Pit is an abandoned gravel pit that can be accessed from the Steese Highway. The surface area is 3.7 ha and maximum depth is 3.3 m (Table 1). The lake was first stocked in 1977 with Arctic grayling sac fry. Arctic grayling were again stocked into this gravel pit in 1978 and from 1984 through 1989. Lake trout fingerlings were stocked in 1988 and 1989.

Table 1. Steese Highway 29.5 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Steese Highway Mile 29.5
Access status:	Road
Endemic species:	Burbot, whitefish
Stocked species:	Arctic grayling, lake trout
Surface area:	3.7 ha
Volume:	31,800 m^3
Maximum depth:	3.3 m
Mean depth:	0.9 m
Alkalinity:	35 mg/L as $CaCO^3$
Morphoedaphic index:	41

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1977	Arctic grayling	Tolsona	Jun 20	10,000	Fry	0.02	1977
1978	Arctic grayling	Tolsona	Jun 12	10,000	Fry	0.01	1978
1984	Arctic grayling	Moose	Jun 7	15,000	Fry	0.01	1984
1985	Arctic grayling	Moose	Jun 21	10,000	Fry	0.02	1985
1986	Arctic grayling	Moose	Jun 11	10,000	Fry	0.02	1986
1987	Arctic grayling	Moose	Jun 15	1,000	Fingerling	0.01	1987
1988	Arctic grayling	Moose	Aug 30	1,000	Fingerling	3.41	1988
1988	Lake trout	Paxson	Jun 14	1,000	Fingerling	4.13	1987
1989	Arctic grayling	Moose	Sep 11	500	Fingerling	3.15	1989
1989	Lake trout	Paxson	Jun 8	500	Fingerling	6.05	1988

-continued-

Table 1. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Arctic grayling	1	1,334	(114)	360	(31)	123	(1)	13	(<1)
	Arctic grayling	2+	73	(32)	20	(9)	240	(5)		
	Burbot	2+	134		36		208	(4)		
1988										
1987	Arctic grayling	1	133	(23)	36	(6)	108	(1)	13	(1)
	Arctic grayling	2+	393	(42)	106	(11)	206	(2)		
	Burbot	2+	45				253	(6)		
1989										
1988	Arctic grayling	1	88	(17)	24	(5)	156	(1)	9	(<1)
	Arctic grayling	2+	152	(24)	41	(6)	193	(3)		
1988	Lake trout	1	0							
	Burbot	2+	27		7		254	(10)		
1990										
1989	Arctic grayling	1	102	(18)	28	(5)	176	(2)	21	(1)
	Arctic grayling	2+	45	(15)	12	(4)	201	(1)		
1989	Lake trout	1	0							
	Burbot	2+	33		9		278	(9)		

A relatively abundant population of burbot resides in the gravel pit. A few round and humpback whitefish have been captured occasionally in sampling gear. The survival rate of Arctic grayling from stocking to age 1 has ranged from 9 to 21%. No lake trout have been captured in sampling gear. The 1986 and 1987 Arctic grayling single species stockings were both fully successful. Mean lengths of age 1 Arctic grayling in 1987 and 1988 were 123 and 108 mm, respectively. The 1988 and 1989 Arctic grayling and lake trout mixed species stockings were fully successful in terms of achieving required densities of age 1 game fish. Stocked Arctic grayling at age 1 were 156 and 176 mm in 1988 and 1989, respectively. However, these two mixed species stockings failed to diversify the sport fishery due to the lack of survival of stocked lake trout.

Steese Highway 30.6 Mile Pit:

Steese Highway 30.6 Mile Pit is an abandoned gravel pit located along the Steese Highway. The surface area is 1.0 ha and maximum depth is 3.0 m (Table 2). The lake was first stocked in 1975 with Arctic grayling sac fry and was similarly stocked in 1978 and from 1984 through 1987. In 1988 and 1989, Arctic char and Arctic grayling fingerlings were stocked. In 1987, the age 1 Arctic grayling population was estimated to have been composed of only 10 fish. In 1988, only age 1 Arctic grayling were captured providing further evidence that survival of Arctic grayling stocked in 1986 was near zero. This lake may occasionally winter-kill and perhaps that is the reason that survival of the Arctic grayling stocked in 1986 was so low. Since 1988, survival rate of Arctic grayling from stocking to age 1 has ranged from 4 to 60%. No Arctic char were captured in sampling gear in 1989. Age 1 Arctic char were captured in 1990 and abundance was estimated to have been 76 fish. Survival of Arctic char to age 1 for fish stocked in 1989 was estimated to have been 15%. The single species stocking of Arctic grayling in 1986 is judged to have been only moderately successful in that density of age 1 game fish resulting from this stocking was estimated to have been only 10.0 fish per ha; mean length was 125 mm. The single species stocking of Arctic grayling in 1987 is judged to have been fully successful and mean length of these fish at age 1 was also 125 mm. The mixed species stockings of Arctic char and Arctic grayling in 1988 and 1989 produced mixed results with both stockings being fully successful in terms of game fish density and mean length at age 1, however, species diversity criteria were only achieved with the 1989 mixed species stocking.

Steese Highway 31.6 Mile Pit

Steese Highway 31.6 Mile Pit is an abandoned gravel pit located along the Steese Highway. The surface area is 1.5 ha and maximum depth is 3.3 m (Table 3). The lake was first stocked in 1977 with Arctic grayling sac fry. Arctic grayling were again stocked in 1978 and from 1983 through 1987. Round whitefish, humpback whitefish, and burbot reside in the gravel pit. The single species stocking of Arctic grayling in 1985 was fully successful and age 1 fish averaged 122 mm in 1986. The single species stocking of Arctic grayling in 1987 was also fully successful. Mean length of age 1 Arctic grayling in 1988 was 104 mm.

Table 2. Steese Highway 30.6 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Steese Highway Mile 30.6
Access status:	Road
Endemic species:	Burbot
Stocked species:	Arctic grayling, Arctic char
Surface area:	1.0 ha
Volume:	12,500 m^3
Maximum depth:	3.0 m
Mean depth:	1.2 m
Alkalinity:	34 mg/L as $CaCO^3$
Morphoedaphic index:	29

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1975	Arctic grayling	Tolsona	Jun 27	5,000	Fry	0.01	1975
1978	Arctic grayling	Tolsona	Jun 12	12,500	Fry	0.01	1978
1984	Arctic grayling	Moose	Jun 7	15,000	Fry	0.01	1984
1985	Arctic grayling	Moose	Jun 21	10,000	Fry	0.02	1985
1986	Arctic grayling	Moose	Jun 11	10,000	Fry	0.02	1986
1987	Arctic grayling	Moose	Jun 15	8,000	Fry	0.01	1987
1988	Arctic char	Aleknagik	Jun 27	1,000	Fingerling	4.19	1987
1988	Arctic grayling	Moose	Aug 30	1,000	Fingerling	3.41	1988
1989	Arctic char	Aleknagik	Jul 18	50	Fingerling	19.97	1988
1989	Arctic grayling	Moose	Sep 11	125	Fingerling	3.15	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Arctic grayling	1	10	(1)	10	(1)	125	<1	<1	
1988										
1987	Arctic grayling	1	496	(14)	496	(14)	125	(<1)	50	(<1)
1989										
1988	Arctic grayling	1	42	(10)	42	(10)	105	(2)	4	(<1)
1988	Arctic char	1	0							
1990										
1989	Arctic char	1	76	(21)	76	(21)	166	(3)	15	(1)
1989	Arctic grayling	1	302	(45)	302	(45)	180	(2)	60	(1)
	Arctic graying	2+	52	(22)	52	(22)	216	(5)		

Table 3. Steese Highway 31.6 Mile: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Steese Highway Mile 31.6
Access status:	Road
Endemic species:	Burbot, whitefish
Stocked species:	Arctic grayling
Surface area:	1.5 ha
Volume:	15,700 m^3
Maximum depth:	3.3 m
Mean depth:	1.1 m
Alkalinity:	20 mg/L as $CaCO^3$
Morphoedaphic index:	19

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1977	Arctic grayling	Tolsona	Jun 20	10,000	Fry	0.02	1977
1978	Arctic grayling	Tolsona	Jun 12	10,000	Fry	0.01	1978
1983	Arctic grayling	Moose	Jun 3	15,000	Fry	0.02	1983
1983	Arctic grayling	Moose	Jun 3	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose	Jun 7	15,000	Fry	0.01	1984
1985	Arctic grayling	Goodpaster	Sep 25	1,600	Fingerling	5.54	1985
1986	Arctic grayling	Moose	Jun 11	4,000	Fry	0.02	1986
1986	Arctic grayling	Moose	Jun 15	4,000	Fry	0.02	1986
1986	Arctic grayling	Moose	Sep 5	200	Fingerling	4.70	1986
1986	Arctic grayling	Moose	Sep 24	325	Fingerling	6.15	1986
1987	Arctic grayling	Moose	Aug 28	400	Fingerling	4.05	1987

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1986										
1985	Arctic grayling	1	552	(80)	368	(53)	122	(1)	33	(<1)
1988										
1987	Arctic grayling	1	77	(13)	51	(9)	104	(1)	19	(<1)

Steese Highway 33.0 Mile Pit:

Steese Highway 33.0 Mile Pit is an abandoned gravel pit located along the Steese Highway. The surface area is 2.9 ha and maximum depth is 4.5 m (Table 4). The lake was first stocked in 1977 with Arctic grayling sac fry. In 1978, 1984, and 1988, the gravel pit was again stocked with Arctic grayling sac fry. In 1987 and 1989, Arctic grayling fingerlings were stocked. Burbot and round whitefish reside in the gravel pit. The survival of Arctic grayling from stocking to age 1 has ranged from 4 to 63%. The single species stockings of Arctic grayling in 1987, 1988, and 1989 were all fully successful. Density of age 1 game fish populations in this gravel pit in 1988, 1989, and 1990 were estimated to have been 523, 148, and 131 fish respectively. Mean length of all three age 1 Arctic grayling cohorts (116 to 125 mm) exceeded the base level of 100 mm.

Steese Highway 33.5 Mile Pit

Steese Highway 33.5 Mile Pit is an abandoned gravel pit which is accessible from the Steese Highway. The surface area is 1.3 ha and mean depth is 1.8 m (Table 5). The gravel pit was first stocked in 1977 with Arctic grayling sac fry and was similarly stocked in 1978 and from 1983 through 1988. In 1989, Arctic grayling fingerlings were stocked. Burbot are the only other fish species present and less than 10 burbot have been captured each year in sampling gear. Between 1988 and 1990, total abundance of Arctic grayling decreased from 630 to 123 fish. Age 1 Arctic grayling were not captured during sampling in 1989. Survival rates of Arctic grayling from stocking to age 1 in 1988 and 1990 was 5 and 8% respectively. The single species stockings of Arctic grayling in 1987 and 1989 were both judged to have been fully successful. Resultant age 1 game fish densities were estimated to have been 388 and 32 fish per ha in 1988 and 1990 respectively. Mean lengths of age 1 Arctic grayling from both of these stockings (158 and 151 mm) exceeded the 100 mm criteria. The single species stocking of Arctic grayling in 1988 was a failure because no fish were captured. However, examination of Table 5 suggests that the stocking may have been successful because age 2+ fish were captured in 1990. This indicates that fish were present in 1989 but were not captured.

Steese Highway 34.6 Mile Pit:

Steese Highway 34.6 Mile Pit is an abandoned gravel pit located along the Steese Highway. The surface area is 2.5 ha and maximum depth is 3.6 m (Table 6). The pit was first stocked in 1975 with Arctic grayling sac fry. In 1978 and from 1983 through 1989 it was again stocked with Arctic grayling sac fry and/or fingerlings. Survival rate of Arctic grayling from stocking to age 1 was 6% for the 1987 stocking cohort and 38% for the 1989 stocking cohort. Lake trout fingerlings were stocked in 1988 and 1989. The gravel pit winter-killed during the winter of 1988-89. Burbot were captured in sampling gear for the first time in 1990. Only four age 1 lake trout were captured in 1990. The single species stocking of Arctic grayling in 1987 was judged fully successful because it resulted in an age 1 game fish density of 200 fish per ha in 1988. Mean length of age 1 fish was 112 mm. The mixed species stocking of Arctic grayling and lake trout in 1988 failed due to the 1988-89 winter-

Table 4. Steese Highway 33.0 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Steese Highway Mile 33.
Access status:	Road
Endemic species:	Burbot, whitefish
Stocked species:	Arctic grayling
Surface area:	2.9 ha
Volume:	42,500 m^3
Maximum depth:	4.5 m
Mean depth:	1.5 m
Alkalinity:	29 mg/L as $CaCO^3$
Morphoedaphic index:	20

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1977	Arctic grayling	Tolsona	Jun 20	10,000	Fry	0.02	1977
1978	Arctic grayling	Tolsona	Jun 12	10,000	Fry	0.01	1978
1984	Arctic grayling	Moose	Jun 7	15,000	Fry	0.01	1984
1987	Arctic grayling	Moose	Jun 15	10,000	Fry	0.02	1987
1988	Arctic grayling	Moose	Jun 14	10,000	Fry	0.02	1988
1989	Arctic grayling	Moose	Sep 11	750	Fingerling	3.15	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1988										
1987	Arctic grayling	1	1,517	(149)	523	(51)	121	(<1)	15	(<1)
	Arctic grayling	2+	1,130	(153)	390	(53)	208	(1)		
1989										
1988	Arctic grayling	1	430	(80)	148	(28)	125	(2)	4	(<1)
	Arctic grayling	2+	320	(89)	110	(31)	234	(4)		
1990										
1989	Arctic grayling	1	380	(76)	131	(26)	116	(1)	63	(1)
	Arctic grayling	2+	770	(176)	266	(61)	173	(1)		

Table 5. Steese Highway 33.5 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Steese Highway Mile 33.5
Access status:	Road
Endemic species:	Burbot
Stocked species:	Arctic grayling
Surface area:	1.3 ha
Volume:	23,400 m^3
Mean depth	1.8
Alkalinity:	21 mg/L as $CaCO^3$
Morphoedaphic index:	12

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1977	Arctic grayling	Tolsona	Jun 20	10,000	Fry	0.02	1977
1978	Arctic grayling	Tolsona	Jun 12	10,000	Fry	0.01	1978
1983	Arctic grayling	Moose	Jun 3	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose	Jun 7	15,000	Fry	0.01	1984
1985	Arctic grayling	Moose	Jun 21	10,000	Fry	0.02	1985
1986	Arctic grayling	Moose	Jun 11	10,000	Fry	0.02	1986
1988	Arctic grayling	Moose	Jun 14	10,000	Fry	0.02	1988
1989	Arctic grayling	Moose	Sep 11	500	Fingerling	3.15	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1988										
1987	Arctic grayling	1	504	(22)	388	(17)	158	(<1)	5	(<1)
	Arctic grayling	2+	126	(2)	97	(2)	222	(1)		
1989										
1988	Arctic grayling	1	0							
1990										
1989	Arctic grayling	1	41	(21)	32	(16)	151		8	(1)
	Arctic grayling	2+	82	(44)	63	(34)	238	(22)		
	Burbot	2+	8				283	(36)		

Table 6. Steese Highway 34.6 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Steese Highway 34.6 Mile
Access status:	Road
Endemic species:	None
Stocked species:	Arctic grayling, lake trout
Surface area:	2.5 ha
Volume:	23,700 m^3
Maximum depth:	3.6 m
Mean depth:	0.9 m
Alkalinity:	58 mg/L as $CaCO^3$
Morphoedaphic index:	61

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1975	Arctic grayling	Tolsona	Jun 27	10,000	Fry	0.01	1975
1978	Arctic grayling	Tolsona	Jun 12	12,500	Fry	0.01	1978
1983	Arctic grayling	Moose	Jun 3	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose	Jun 7	15,000	Fry	0.01	1984
1985	Arctic grayling	Goodpaster	Sep 25	1,663	Fingerling	5.54	1985
1986	Arctic grayling	Moose	Jun 11	8,000	Fry	0.02	1986
1986	Arctic grayling	Moose	Sep 5	400	Fingerling	4.70	1986
1986	Arctic grayling	Moose	Sep 24	400	Fingerling	6.15	1986
1987	Arctic grayling	Moose	Aug 28	1,000	Fingerling	4.05	1987
1988	Arctic grayling	Moose	Aug 30	800	Fingerling	3.41	1988
1988	Lake trout	Paxson	Jun 14	800	Fingerling	4.13	1987
1989	Arctic grayling	Moose	Sep 11	400	Fingerling	3.15	1989
1989	Lake trout	Paxson	Jun 8	400	Fingerling	6.05	1988

-continued-

Table 6. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1988										
1987	Arctic grayling	1	499	(24)	200	(10)	112	(<1)	6	(<1)
1989										
1988	Arctic grayling	1	0							
1988	Lake trout	1	0							
1990										
1989	Lake trout	1	4		2		162	(3)		
1988	Lake trout	2	0							
1989	Arctic grayling	1	150	(21)	60	(8)	148	(1)	38	(1)
1988	Burbot	2+	36		14		204	(2)		

kill. The mixed species stocking of Arctic grayling and lake trout in 1989 was fully successful because it resulted in a game fish density of 62 age 1 fish per ha in 1990. Mean length of both species at age 1 exceeded 100 mm, (Arctic grayling = 148 mm; lake trout = 162 mm). However, species diversity of age 1 game fish in 1990 was judged inadequate to provide an added attractant to anglers.

Steese Highway 35.8 Mile Pit:

Steese Highway 35.8 Mile Pit is an abandoned gravel pit which can be accessed from the Steese Highway. The surface area is 1.0 ha and maximum depth is 3.9 m (Table 7). The gravel pit was first stocked in 1983 with Arctic grayling sac fry and was stocked annually with Arctic grayling from 1984 through 1989. No other species of fish are present. There may have been full or partial winter-kills during the winters of 1986-87 and 1988-89 because no Arctic grayling were captured in 1987 and 1989 and only a few age 2 or older Arctic grayling were captured in sampling gear in 1990. Survival to age 1 of stocked fingerling Arctic grayling was estimated to have been 49% in 1988 and 25% in 1990. The single species stockings of Arctic grayling in 1986 and 1988 were both judged to have been failures. The single species stockings of Arctic grayling in 1987 and 1989 were both judged to have been fully successful (game fish densities were 493 and 76 age 1 fish per ha respectively). Mean length of age 1 fish exceeded 100 mm criteria. The two winter-kills likely obviated the apparent success of the 1987 and 1989 stockings of Arctic grayling in this gravel pit.

Steese Highway 36.6 Mile Pit:

Steese Highway 36.6 Mile Pit is an abandoned gravel pit located near the Steese Highway. The surface area is 3.8 ha and maximum depth is 3.9 m (Table 8). Arctic grayling were first stocked in 1977. Arctic grayling were again stocked into this gravel pit in 1978, 1983, 1984, 1986, 1987, and 1989. In 1988 and 1989, Arctic char were stocked. Burbot reside in this gravel pit and in 1989, 45 burbot were caught whereas, in 1990, 20 burbot were caught. The abundance of Arctic grayling has decreased each year since 1987. No Arctic char were captured through the sampling program in 1989 or 1990. The single species stockings of Arctic grayling in 1986 and 1987 were both fully successful producing densities of age 1 game fish the following year of 176 and 74 fish per ha respectively. Mean length of age 1 fish exceeded the criteria of 100 mm. The single species stocking of Arctic char in 1988 was a failure. The mixed species stocking of Arctic char and Arctic grayling in 1989 was moderately successful in terms of density of age 1 game fish (9 fish per ha), however, species diversity was inadequate due to the lack of survival of stocked Arctic char. Age 1 Arctic grayling averaged 143 mm in 1990.

Steese Highway 39.3 Mile Pit:

Steese Highway 39.3 Mile Pit is an abandoned gravel pit accessible from the Steese Highway. The surface area is 2.0 ha and maximum depth is 3.6 m (Table 9). This gravel pit was first stocked in 1989 with rainbow trout fingerlings. At least two ages of Arctic grayling were also present during sampling in 1990. Survival rate of rainbow trout from stocking to age 1 was estimated to

Table 7. Steese Highway 35.8 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Steese Highway Mile 35.8
Access status:	Road
Endemic species:	None
Stocked species:	Arctic grayling
Surface area:	1.0 ha
Volume:	16,800 m^3
Maximum depth:	3.9 m
Mean depth:	1.6 m
Alkalinity:	21 mg/L as $CaCO^3$
Morphoedaphic index:	13

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1983	Arctic grayling	Moose	Jun 3	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose	Jun 7	15,000	Fry	0.01	1984
1985	Arctic grayling	Moose	Jun 21	10,000	Fry	0.02	1985
1986	Arctic grayling	Moose	Jun 11	10,000	Fry	0.02	1986
1987	Arctic grayling	Moose	Aug 28	400	Fingerling	4.05	1987
1988	Arctic grayling	Moose	Aug 30	1,000	Fingerling	3.41	1988
1989	Arctic grayling	Moose	Sep 11	300	Fingerling	3.15	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Arctic grayling	1	0							
1988										
1987	Arctic grayling	1	493	(75)	493	(75)	105	(<1)	49	(1)
1989										
1988	Arctic grayling	1	0							
1990										
1989	Arctic grayling	1	76	(7)	76	(7)	150	(2)	25	(1)
	Arctic grayling	2+	7	(3)	7	(3)	271	(5)		

Table 8. Steese Highway 36.6 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Steese Highway Mile 36.6
Access status:	Road
Endemic species:	Burbot
Stocked species:	Arctic grayling, Arctic char
Surface area:	3.8 ha
Volume:	41,000 m^3
Maximum depth:	3.9 m
Mean depth:	1.1 m
Alkalinity:	62 mg/L as $CaCO^3$
Morphoedaphic index:	58

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1977	Arctic grayling	Tolsona	Jun 20	10,000	Fry	0.02	1977
1978	Arctic grayling	Tolsona	Jun 12	10,000	Fry	0.01	1978
1983	Arctic grayling	Moose	Jun 3	15,000	Fry	0.01	1983
1984	Arctic grayling	Moose	Jun 7	15,000	Fry	0.01	1984
1986	Arctic grayling	Moose	Jun 11	10,000	Fry	0.02	1986
1987	Arctic grayling	Moose	Jun 15	10,000	Fry	0.01	1987
1988	Arctic char	Aleknagik	Jun 27	1,000	Fingerling	4.19	1987
1989	Arctic grayling	Moose	Sep 11	125	Fingerling	3.15	1989
1989	Arctic char	Aleknagik	Jul 18	50	Subcatch.	19.97	1988

-continued-

Table 8. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Arctic grayling	1	668	(106)	176	(28)	132	(<1)	7	(<1)
	Arctic grayling	2+	0							
1988										
1987	Arctic grayling	1	281	(48)	74	(13)	103	(<1)	28	(1)
	Arctic grayling	2+	0							
1989										
	Arctic grayling	2+	180	(45)	47	(12)	190	(6)		
1988	Arctic char	1	0							
	Burbot	2+	45				267	(5)		
1990										
1989	Arctic grayling	1	33	(15)	9	(4)	143	(16)	3	(<1)
	Arctic grayling	2+	131	(58)	35	(15)	203	(4)		
1989	Arctic char	1	0							
	Burbot	2+	20				410	(19)		

Table 9. Steese Highway 39.3 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Steese Highway Mile 39.3
Access status:	Road
Endemic species:	Arctic grayling
Stocked species:	Rainbow trout
Surface area:	2.0 ha
Maximum depth:	3.6 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1989	Rainbow trout	Swanson R	Aug 27	1,000	Fingerling	1.00	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1990										
1989	Arctic grayling[a]	1	168	(46)	83	(23)	145	(3)		
	Arctic grayling[a]	2+	70	(36)	35	(18)	214	(8)		
1989	Rainbow trout	1	1,477	(430)	730	(213)	150	(2)	148[b]	(2)

[a] There is no record of Arctic grayling being stocked in Steese Highway 39.3 Mile Pit. Age was based on analysis of length frequencies.

[b] Survival cannot exceed 100% and in further analysis, the survival rate is assumed to have been 100%; see text for explanation.

have exceeded 100%, likely, the number of fish stocked exceeded the stocking record of 1,000 fingerlings. The single species stocking of rainbow trout into this gravel pit in 1989 was judged fully successful based upon the estimated game fish density of 730 age 1 fish per ha. Mean length of age 1 rainbow trout was 150 mm.

Chena Hot Springs Road 32.9 Mile Pit:

Chena Hot Springs Road 32.9 Mile Pit is an abandoned gravel pit located along the Chena Hot Spring Road. The surface area is 2.5 ha and maximum depth is 5.5 m (Table 10). The gravel pit was first stocked in 1984 with Arctic grayling sac fry and the pit was stocked with Arctic grayling annually from 1985 through 1989. The survival of Arctic grayling from stocking to age 1 was 62% in 1988 and 60% in 1990. Arctic char fingerlings were stocked in 1988 and Arctic char sub-catchables were stocked in 1989. No other species of fish are present in this gravel pit. The lake winter-killed during the winter of 1988-89 and no fish were captured in sampling gear in 1989. In 1990, no age 1 Arctic char that were stocked in 1988 were captured and only 13 Arctic char were captured in 1990 that were stocked as sub-catchables in 1989. The single species stocking of Arctic grayling in 1987 was fully successful (estimated density of age 1 game fish population = 249 fish per ha) and mean length of age 1 fish was 110 mm. The mixed species stocking of Arctic char and Arctic grayling in 1988 was a failure and this result was probably due to a 1988-89 winter-kill. The 1989 mixed species stocking of Arctic char and Arctic grayling was fully successful in terms of density of age 1 game fish (79 fish per ha), Arctic char averaged 188 mm and Arctic grayling averaged 132 mm, however species diversity was inadequate to provide an added attractant to anglers.

Chena Hot Springs Road 42.8 Mile Pit:

Chena Hot Springs Road 42.8 Mile Pit is an abandoned gravel pit located near the Chena Hot Spring Road. The surface area is 3.2 ha and maximum depth is 3.6 m (Table 11). This gravel pit was first stocked in 1983 with Arctic grayling sac fry. Arctic grayling were stocked annually from 1984 through 1989. Stocking of fish into this gravel pit was stopped after 1989 because no Arctic grayling were captured in sampling gear in 1987 and 1988 and the program was assumed to be a failure. Burbot, longnose suckers, and lake chubs were captured in large numbers in sampling gear during 1987 and 1988 but abundance of these populations was not estimated. The 1986 and 1987 single species stockings of Arctic grayling into Chena Hot Springs Road 42.8 Mile Pit were judged failures based upon sampling results in 1986 and 1987. Single species stockings of Arctic grayling into this gravel pit during other years probably also failed to produce fishable populations of game fish for anglers.

Chena Hot Springs Road 45.5 Mile Pit:

Chena Hot Springs Road 45.5 Mile Pit is an abandoned gravel pit located along the Chena Hot Spring Road. The surface area is 3.2 ha and maximum depth is 4.5 m (Table 12). The gravel pit was first stocked in 1983 with Arctic grayling and from 1984 through 1989, Arctic grayling were again stocked. Rainbow trout fingerlings were stocked in 1986, 1987, and 1989. No other fish

Table 10. Chena Hot Springs Road 32.9 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Chena Hot Springs Road Mile 32.9
Access status:	Road
Endemic species:	None
Stocked species:	Arctic grayling, Arctic char
Surface area:	2.5 ha
Volume:	39,400 m^3
Maximum depth:	5.5 m
Mean depth:	1.6 m
Alkalinity:	183 mg/L as $CaCO^3$
Morphoedaphic index:	116

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1984	Arctic grayling	Moose L	Jun 7	15,000	Fry	0.01	1984
1985	Arctic grayling	Goodpaster R	Jun 13	40,000	Fry	0.02	1985
1986	Arctic grayling	Moose L	Jun 11	10,000	Fry	0.02	1986
1986	Arctic grayling	Moose L	Sep 24	500	Fingerling	6.15	1986
1986	Arctic grayling	Moose L	Sep 5	500	Fingerling	4.70	1986
1987	Arctic grayling	Moose L	Aug 28	1,000	Fingerling	4.05	1987
1988	Arctic char	Aleknagik L	Jun 27	1,000	Fingerling	4.19	1987
1988	Arctic grayling	Moose L	Aug 30	1,000	Fingerling	3.41	1988
1989	Arctic char	Aleknagik L	Jul 18	110	Subcatch.	19.97	1988
1989	Arctic grayling	Moose L	Sep 11	310	Fingerling	3.15	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1988										
1987	Arctic grayling	1	624	(60)	249	(24)	110	(<1)	62	(1)
	Arctic grayling	2+	264	(51)	106	(20)	252	(4)		
1989										
1988	Arctic grayling	1	0							
1988	Arctic char	1	0							
1990										
1989	Arctic grayling	1	186	(23)	74	(9)	132	(2)	60	(2)
1989	Arctic char	1	0							
	Arctic char	2+	13		5		188	(5)		

Table 11. Chena Hot Springs Road 42.8 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Chena Hot Springs Road Mile 42.8
Access status:	Road
Endemic species:	Longnose sucker, lake chub, burbot
Stocked species:	Arctic grayling
Surface area:	3.2 ha
Volume:	48,600 m^3
Maximum depth:	3.6 m
Mean depth:	1.5 m
Alkalinity:	80 mg/L as $CaCO^3$
Morphoedaphic index:	53

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1983	Arctic grayling	Moose L	Jun 3	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose L	Jun 7	10,000	Fry	0.01	1984
1985	Arctic grayling	Moose L	Jun 21	10,000	Fry	0.02	1985
1986	Arctic grayling	Moose L	Jun 11	10,000	Fry	0.02	1986
1987	Arctic grayling	Moose L	Aug 28	1,000	Fingerling	4.05	1987
1988	Arctic grayling	Moose L	Aug 30	1,000	Fingerling	3.41	1988
1989	Arctic grayling	Moose L	Sep 11	1,000	Fingerling	3.15	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance (SE)	Density in fish per hectare (SE)	Mean length in mm (SE)	Percent survival to age 1 (SE)
1987						
1986	Arctic grayling	1	0			
1988						
1987	Arctic grayling	1	0			

Table 12. Chena Hot Springs Road 45.5 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Chena Hot Springs Road Mile 45.5
Access status:	Road
Endemic species:	None
Stocked species:	Rainbow trout, Arctic grayling
Surface area:	3.2 ha
Volume:	43,900 m^3
Maximum depth:	4.5 m
Mean depth:	1.4 m
Alkalinity:	42 mg/L as $CaCO^3$
Morphoedaphic index:	31

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1983	Arctic grayling	Moose L	Jun 3	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose L	Jun 7	10,000	Fry	0.01	1984
1985	Arctic grayling	Moose L	Jun 21	10,000	Fry	0.02	1985
1986	Arctic grayling	Moose L	Jun 11	10,000	Fry	0.02	1986
1986	Rainbow trout	Swanson R	Sep 2	1,000	Fingerling	2.22	1986
1987	Arctic grayling	Moose L	Aug 28	800	Fingerling	4.05	1987
1987	Arctic grayling	Moose L	Jun 15	10,000	Fry	0.01	1987
1987	Rainbow trout	Swanson R	Sep 2	1,000	Fingerling	2.22	1987
1988	Arctic grayling	Moose L	Jun 14	10,000	Fry	0.02	1988
1989	Arctic grayling	Moose L	Sep 11	500	Fingerling	3.15	1989
1989	Rainbow trout	Swanson R	Aug 14	600	Fingerling	1.02	1989

-continued-

Table 12. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Rainbow trout	1	547	(27)	171	(8)	94	(1)	55	(1)
1986	Arctic grayling	1	1,568	(112)	490	(35)	104	(1)	16	(<1)
1988										
1987	Rainbow trout	1	427	(39)	133	(12)	85	(1)	43	(1)
1986	Rainbow trout	2	1,185	(90)	371	(28)	181	(2)		
1987	Arctic grayling	1	169	(45)	53	(14)	108	(1)	2	(<1)
	Arctic grayling	2+	73	(36)	23	(11)	208	(2)		
1989										
	Rainbow trout	2+	824	(85)	258	(26)	174	(1)		
1988	Arctic grayling	1	351	(64)	110	(20)	136	(1)	4	(<1)
	Arctic grayling	2+	406	(96)	127	(30)	207	(1)		
1990										
1989	Rainbow trout	1	460	(199)	144	(62)	125	(3)	77	(2)
	Rainbow trout	2+	729	(395)	228	(123)	206	(2)		
1989	Arctic grayling	1	467	(185)	146	(58)	130	(1)	93	(3)
	Arctic grayling	2+	1,196	(541)	374	(169)	210	(6)		

species are present. The single species stocking of Arctic grayling in 1988 was fully successful and mean length of resultant age 1 fish in 1989 was 136 mm. The mixed species stockings of Arctic grayling and rainbow trout in this gravel pit in 1986, 1987, and 1989 are all judged to have been fully successful in terms of density of age 1 game fish (estimated density of age 1 game fish ranged from 186 to 661 fish per ha) and in terms of providing diversity as an attractant to anglers. Mean length of age 1 Arctic grayling resulting from all three of these stockings have exceeded the base level of 100 mm (range from 104 to 130 mm). Mean length of rainbow trout at age 1 for fish stocked in 1989 was 125 mm; however rainbow trout stocked in 1986 and 1987 only achieved a mean length of 94 and 85 mm, respectively.

Chena Hot Springs Road 47.9 Mile Pit:

Chena Hot Springs Road 47.9 Mile Pit is an abandoned gravel pit located near the Chena Hot Spring Road. The surface area is 2.3 ha and maximum depth is 5.4 m (Table 13). This gravel pit was first stocked in 1983 with Arctic grayling sac fry. Arctic grayling were again stocked from 1984 through 1989. Lake trout fingerlings were stocked in 1988 and 1989 and survival of these cohorts from stocking to age 1 was estimated to have been zero. Burbot were captured in the sampling gear in 1989 and 1990. The 1986 single species stocking of Arctic grayling was judged to have been a failure. The single species stocking of Arctic grayling in 1987 was fully successful (estimated age 1 game fish density = 81 fish per ha), however, age 1 Arctic grayling only averaged 98 mm in length. The mixed species stocking of Arctic grayling and lake trout in 1988 was only moderately successful (estimated density of age 1 game fish = 8 fish per ha), mean length of age 1 Arctic grayling was 143 mm, and diversity was inadequate to provide an added attractant to anglers due to the lack of survival of stocked lake trout. The mixed species stockings of Arctic grayling and lake trout in 1989 was fully successful (estimated density of age 1 game fish = 64 fish per ha), mean length of age 1 Arctic grayling was 141 mm, however diversity was inadequate to provide an added attractant to anglers due to the continued lack of survival of stocked lake trout.

Bathing Beauty Pond:

Bathing Beauty Pond is an abandoned gravel pit located along the Richardson Highway at Mile Post 343.6 near Fairbanks. The surface area is 2.8 ha and maximum depth is 6.7 m (Table 14). Bathing Beauty Pond was first stocked in 1975 with Arctic grayling sac fry. The pond was again stocked with Arctic grayling in 1978 and from 1983 through 1988. Arctic grayling have also successfully reproduced in the pond. Rainbow trout fingerlings were stocked from 1986 through 1990. Arctic char and lake trout were both stocked in 1988 and 1989. No other endemic or stocked species are present. Bathing Beauty Pond has supported a modest sport fishery since the mid 1980's. The abundance of age 1 rainbow trout and Arctic grayling has decreased since 1987. During this period fewer of these species were stocked in successive years. Survival rates of rainbow trout from stocking to age 1 have ranged from 18 to 53%. Survival rates of Arctic grayling from stocking to age 1 have ranged from 1 to 32%. Only a few Arctic char and lake trout stocked as fingerlings have been captured in sampling gear. Arctic char captured in 1990 were stocked as adults and as sub-catchables in 1989. The mixed species stocking of Arctic

Table 13. Chena Hot Springs Road 47.9 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Chena Hot Springs Road Mile 47.9
Access status:	Road
Endemic species:	Burbot
Stocked species:	Lake trout, Arctic grayling
Surface area:	2.3 ha
Volume:	71,100 m^3
Maximum depth:	5.4 m
Mean depth:	3.1 m
Alkalinity:	43 mg/L as $CaCO^3$
Morphoedaphic index:	14

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1983	Arctic grayling	Moose L	Jun 3	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose L	Jun 7	10,000	Fry	0.01	1984
1985	Arctic grayling	Moose L	Jun 21	10,000	Fry	0.02	1985
1986	Arctic grayling	Moose L	Jun 11	8,000	Fry	0.02	1986
1986	Arctic grayling	Moose L	Sep 24	400	Fingerling	6.15	1986
1986	Arctic grayling	Moose L	Sep 5	400	Fingerling	4.70	1986
1987	Arctic grayling	Moose L	Aug 28	800	Fingerling	4.05	1987
1988	Arctic grayling	Moose L	Aug 30	800	Fingerling	3.41	1988
1988	Lake trout	Paxson L	Jun 14	800	Fingerling	4.13	1987
1989	Arctic grayling	Moose L	Sep 11	400	Fingerling	3.15	1989
1989	Lake trout	Paxson L	Jun 8	400	Fingerling	6.05	1988

-continued-

Table 13. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Arctic grayling	1	0							
1988										
1987	Arctic grayling	1	186	(0)	81	(0)	98	(1)	19	(0)
1989										
1988	Lake trout	1	0							
1988	Arctic grayling	1	18		8		143	(3)		
	Arctic grayling	2+	13				225	(3)		
	Burbot	2+	32				258	(17)		
1990										
1989	Lake trout	1	0							
1989	Arctic grayling	1	148	(42)	64	(18)	141	(2)	37	(2)
	Arctic grayling	2+	122	(51)	53	(22)	197	(4)		
	Burbot	2+	13				218	(13)		

Table 14. Bathing Beauty Pond: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 343.6
Access status:	Road
Endemic species:	None
Stocked species:	Arctic grayling, rainbow trout, lake trout, Arctic char
Surface area:	2.8 ha
Volume:	179,100 m^3
Maximum depth:	6.7 m
Mean depth:	3.1 m
Alkalinity:	109 mg/L as $CaCO^3$
Morphoedaphic index:	35

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1975	Arctic grayling	Tolsona	Jun 27	25,000	Fry	0.01	1975
1978	Arctic grayling	Tolsona	Jun 12	12,500	Fry	0.01	1978
1983	Arctic grayling	Moose	Jun 2	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose	Jun 8	15,000	Fry	0.01	1984
1985	Arctic grayling	Moose	Jun 21	10,000	Fry	0.02	1985
1986	Arctic grayling	Moose	Sep 5	10,000	Fry	0.02	1986
1986	Rainbow trout	Swanson	Aug 20	1,000	Fingerling	1.62	1986
1987	Arctic grayling	Moose	Aug 28	1,000	Fingerling	4.05	1987
1987	Rainbow trout	Swanson	Aug 27	500	Fingerling	2.16	1987
1988	Arctic char	Aleknagik	Jun 27	350	Fingerling	4.19	1987
1988	Arctic grayling	Moose	Aug 25	350	Fingerling	2.69	1988
1988	Lake trout	Paxson	Jun 14	350	Fingerling	4.13	1987
1988	Rainbow trout	Swanson	Aug 16	350	Fingerling	1.08	1988
1989	Arctic char	Aleknagik	Jul 20	125	Subcatch.	19.40	1988
1989	Arctic char	Aleknagik	Feb 3	250	Catchable	142.80	1987
1989	Lake trout	Paxson	Jun 5	350	Fingerling	6.31	1988
1989	Rainbow trout	Swanson	Aug 7	350	Fingerling	1.20	1989
1990	Rainbow trout	Swanson	Jul 24	700	Fingerling	1.60	1990

-continued-

Table 14. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Rainbow trout	1	527	(66)	186	(23)	183	(2)	53	(1)
1986	Arctic grayling	1	77	(2)	27	(1)	187	(2)	1	(<1)
	Arctic grayling	2+	351	(52)	124	(18)	257	(6)		
1988										
1987	Rainbow trout	1	113	(21)	40	(7)	129	(2)	32	(1)
	Rainbow trout	2+	109	(25)	39	(14)	208	(3)		
1987	Arctic grayling	1	318	(33)	114	(11)	127	(2)	32	(1)
	Arctic grayling	2+	61	(21)	22	(8)	221	(4)		
1989										
1988	Rainbow trout	1	185	(47)	65	(17)	111	(1)	53	(1)
	Rainbow trout	2+	85	(40)	30	(14)	232	(7)		
1988	Arctic grayling	1	66	(22)	23	(8)	114	(3)	19	(1)
	Arctic grayling	2+	467	(118)	165	(42)	208	(4)		
1988	Arctic char	1	2		<1		131	(4)		
1988	Lake trout	1	1		<1		130			
1990										
1989	Rainbow trout	1	64	(20)	23	(7)	153	(2)	18	(1)
	Rainbow trout	2+	52	(24)	18	(8)	178	(2)		
1989	Arctic grayling	1[a]					130	(6)		
	Arctic grayling	2+	115	(31)	41	(11)	218	(6)		
1989	Lake trout	1	0							
1989	Arctic char	1	0							
	Arctic char	2	94	(30)	33	(11)	226	(1)		
1988	Lake trout	2	1		<1		193			

[a] No Arctic grayling were stocked in 1989. Age 1 Arctic grayling may be from natural reproduction.

grayling and rainbow trout in 1986 and 1987 were fully successful (estimated density of age 1 game fish was 213 and 154 fish per ha respectively), stocked age 1 game fish all exceeded 100 mm in mean length, and species diversity criteria were met. The mixed species stocking of Arctic char, Arctic grayling, lake trout, and rainbow trout in 1988 was fully successful (estimated density of age 1 game fish = 88 fish per ha), mean length of age 1 fish of all species exceeded 100 mm, however, Arctic char and lake trout survived at such low rates that both of these two species failed to represent at least 10% of the population of age 1 game fish. Although species diversity criteria was not achieved from the stockings in 1988, there were 43 rainbow trout and 150 Arctic graying estimated to have been harvested in 1989 (Appendix A). The mixed species stocking of Arctic char, lake trout, and rainbow trout in 1989 was fully successful resulting in an estimated density of 23 age 1 game fish per ha in 1990. No age 1 Arctic char nor lake trout were caught in 1990; hence, species diversity criteria for the mixed species stocking were not achieved. Age 1 rainbow trout averaged 153 mm in 1990.

Grayling Lake:

Grayling Lake is an abandoned gravel pit located along the Richardson Highway at Mile Post 341.0 on Eielson Air Force Base. The surface area is 8.7 ha and maximum depth is 4.2 m (Table 15). Grayling Lake was first stocked in 1975 with Arctic grayling sac fry. Arctic grayling were again stocked from 1983 through 1987, in 1989 and in 1990. Sheefish *Stenodus leucichthys* were stocked in 1984. Rainbow trout were stocked from 1986 through 1990. Arctic char and lake trout were both stocked in 1988 and 1989. Northern pike are endemic. No other fish species are present. Since 1987, no fish that were stocked were subsequently captured in sampling gear. The 1986 and 1987 mixed species stockings of Arctic grayling and rainbow trout failed. The mixed species stocking of Arctic char, lake trout and rainbow trout in 1988 failed. The mixed species stocking of Arctic char, Arctic grayling, lake trout, and rainbow trout in 1989 also failed. However, a modest population of age 2 rainbow trout were found in Grayling Lake in 1989 and modest populations of age 2 Arctic grayling and rainbow trout were found in the lake in 1990, indicating that although the mixed species stockings were considered to be failures, a few fish had survived.

Hidden Lake:

Hidden Lake is also an abandoned gravel pit located along the Richardson Highway at Mile Post 341.0 on Eielson Air Force Base. The surface area is 7.3 ha and maximum depth is 3.8 m (Table 16). Hidden Lake was first stocked in 1975 with Arctic grayling sac fry. Arctic grayling were again stocked in 1978, from 1983 through 1986, and in 1988 and 1989. Rainbow trout were stocked in 1982, 1986, and from 1988 through 1990. Arctic char were stocked in 1988 and 1989 and lake trout were stocked in 1989. The lake was chemically treated with rotenone during the winter of 1987-88 because, during sampling in 1986 and 1987, few stocked fish were captured while excessive numbers of longnose suckers and lake chubs were captured. Few stocked fish were captured in sampling gear in 1989 and 1990. In 1990, northern pike larger than 500 mm were captured in sampling gear suggesting they were placed in the lake recently by the public. The mixed species stocking of age 0 Arctic char and

Table 15. Grayling Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 341
Access status:	Road
Endemic species:	Northern Pike
Stocked species:	Arctic grayling, rainbow trout, lake trout, sheefish
Surface area:	8.7 ha
Volume:	116,200 m^3
Maximum depth:	4.2 m
Mean depth:	1.3 m
Alkalinity:	117 mg/L as $CaCO^3$
Morphoedaphic index:	88

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1975	Arctic grayling	Tolsona	Jun 26	10,000	Fry	0.01	1975
1975	Arctic grayling	Tolsona	Jun 27	25,000	Fry	0.01	1975
1983	Arctic grayling	Moose	Jun 2	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose	Jun 8	15,000	Fry	0.01	1984
1984	Sheefish	Koy-Yukon	Aug 13	500	Fingerling	3.20	1983
1985	Arctic grayling	Moose	Jun 21	10,000	Fry	0.02	1985
1986	Arctic grayling	Moose	Jun 11	10,000	Fry	0.02	1986
1986	Rainbow trout	Swanson	Aug 20	500	Fingerling	1.62	1986
1987	Arctic grayling	Moose	Aug 28	1,000	Fingerling	4.05	1987
1987	Rainbow trout	Swanson	Aug 27	500	Fingerling	2.16	1987
1988	Arctic char	Aleknagik	Jun 27	1,000	Fingerling	4.19	1987
1988	Lake trout	Paxson	Jun 14	1,000	Fingerling	4.13	1987
1988	Rainbow trout	Swanson	Aug 16	1,000	Fingerling	1.08	1988
1989	Arctic char	Aleknagik	Jul 20	260	Subcatch.	19.40	1988
1989	Arctic grayling	Moose	Sep 14	1,000	Fingerling	5.36	1989
1989	Arctic grayling	Moose	Jun 13	10,000	Fry	0.02	1989
1989	Lake trout	Paxson	Jun 5	1,000	Fingerling	6.31	1988
1989	Lake trout	Paxson	Aug 18	550	Subcatch.	20.48	1988
1989	Rainbow trout	Swanson	Aug 7	1,000	Fingerling	1.20	1989
1990	Arctic grayling	Moose	Jun 6	10,000	Fry	0.02	1990
1990	Rainbow trout	Swanson	Jul 24	500	Fingerling	1.60	1990

-continued-

Table 15. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Arctic grayling	1	0							
1986	Rainbow trout	1	0							
1988										
1987	Arctic grayling	1	0							
1987	Rainbow trout	1	0							
1989										
1988	Rainbow trout	1	0							
	Rainbow trout	2+	88	(44)	10	(5)	254	(12)		
1988	Arctic char	1	0							
1988	Lake trout	1	0							
	Northern pike	2+	12				372	(15)		
1990										
1989	Arctic grayling	1	0							
	Arctic grayling	2+	18		2		241	(8)		
1989	Arctic char	1	0							
1989	Lake trout	1	0							
1989	Rainbow trout	1	0							
	Rainbow trout	2+	10		1		240	(14)		
1988	Northern pike	2+	6				437	(72)		

Table 16. Hidden Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 341
Access status:	Road
Endemic species:	Lake chub, northern pike, longnose suckers
Stocked species:	Rainbow trout, Arctic grayling, Arctic char, lake trout
Surface area:	7.3 ha
Maximum depth:	3.8 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1975	Arctic grayling	Tolsona L	Jun 27	25,000	Fry	0.01	1975
1975	Arctic grayling	Tolsona L	Jun 26	10,000	Fry	0.01	1975
1978	Arctic grayling	Tolsona L	Jun 12	12,500	Fry	0.01	1978
1982	Rainbow trout	Swanson R	Sep 1	3,988	Fingerling	1.44	1982
1983	Arctic grayling	Moose L	Jun 2	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose L	Jun 8	15,000	Fry	0.01	1984
1985	Arctic grayling	Moose L	Jun 21	10,000	Fry	0.02	1985
1986	Arctic grayling	Moose L	Jun 11	10,000	Fry	0.02	1986
1986	Rainbow trout	Swanson R	Aug 18	4,000	Fingerling	1.32	1986
1986	Rainbow trout	Swanson R	Aug 20	500	Fingerling	1.62	1986
1988	Arctic char	Aleknagik L	Jun 27	3,600	Fingerling	4.19	1987
1988	Arctic grayling	Moose L	Jun 14	10,000	Fry	0.02	1988
1988	Rainbow trout	Big Lake	Jun 10	1,800	Catchable	89.70	1987
1989	Arctic char	Aleknagik L	Jul 20	630	Subcatch.	19.40	1988
1989	Arctic grayling	Moose L	Sep 14	1,800	Fingerling	5.36	1989
1989	Lake trout	Paxson L	Aug 18	600	Subcatch.	20.50	1988
1989	Rainbow trout	Swanson L	Aug 7	900	Fingerling	1.20	1989
1990	Rainbow trout	Swanson R	Jul 24	3,600	Fingerling	1.60	1990

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Table 16. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1 (SE)
1989									
	Rainbow trout	2+	144	(10)	20	(1)	250	(2)	
1988	Arctic grayling	1	17		2		164	(2)	
1988	Arctic char	1	16		2		200	(7)	
1990									
1989	Rainbow trout	1	0		0				
	Rainbow trout	2+	36		5		175	(4)	
1989	Arctic grayling	1	0		0				
	Arctic grayling	2+	4		1		272	(9)	
1989	Arctic char	1	0		0				
1989	Lake trout	1	0		0				
1988	Northern pike	2+	5		1		620	(30)	

Arctic grayling in 1988 was only moderately successful. This stocking resulted in an estimated density of 2.0 age 1 Arctic char per ha in 1989 with a mean length 200 mm and an estimated density of 2.0 age 1 Arctic grayling per ha with a mean length of 164 mm. The mixed species stocking of age 0 Arctic char, Arctic grayling, lake trout, and rainbow trout in 1989 was a failure. The stocking of catchable sized rainbow trout in early summer of 1988 following rotenoning of the lake during the winter of 1987 resulted in a population of 144 fish in 1989 with an average length of 250 mm.

Richardson Highway 28 Mile Pit:

Richardson Highway 28 Mile Pit is an abandoned gravel pit on Eielson Air Force Base which is accessible from the Richardson Highway at Mile Post 335.1. The surface area is 3.2 ha and maximum depth is 3.9 m (Table 17). This gravel pit was first stocked in 1977 with coho salmon fingerlings. Coho salmon were again stocked in 1979, 1981, 1982, and from 1984 through 1990. Arctic char were stocked in 1988 and 1989 and rainbow trout were stocked in 1989 and 1990. Lake chubs were first captured in sampling gear in 1987. From 1989 to 1990 the abundance of age 1 coho salmon increased from 77 to 794 fish. The abundance of age 2 coho salmon decreased from 855 to 197 fish over the same time period. Fish captured in 1990 were noticeably thinner than fish captured in 1989. The mixed species stocking of Arctic char and coho salmon in 1988 was fully successful resulting in an age 1 game fish density of 24 fish per ha; mean length of age 1 coho salmon was 148 mm, however, species diversity was judged inadequate due to the poor survival of Arctic char. The mixed species stocking of Arctic char, coho salmon, and rainbow trout in 1989 was determined to be fully successful based upon the estimated density of 266 age 1 game fish residing in the lake in 1990; however, species diversity was judged inadequate because of the lack of survival of Arctic char and because rainbow trout represented only 7.9% of the age 1 game fish population. In 1990, mean length of age 1 coho salmon was 137 mm and mean length of age 1 rainbow trout was 138 mm.

Richardson Highway 31 Mile Pit:

Richardson Highway 31 Mile Pit is an abandoned gravel pit accessible from the Richardson Highway at Mile Post 332.0. The surface area is 7.3 ha and maximum depth is 6.6 m (Table 18). Richardson Highway 31 Mile Pit was first stocked in 1952 with rainbow trout fingerlings and was stocked annually with rainbow trout until 1961. Arctic grayling sac fry were stocked from 1965 through 1984. For brevity, only the stocking history of this gravel pit from 1967 through 1990 are included in Table 18 and only the stocking history since 1985 will be further discussed. Fingerling coho salmon were stocked from 1985 through 1989. Rainbow trout were stocked from 1986 through 1989 and Arctic char were stocked in 1988 and 1989. Arctic grayling resulting from natural reproduction have been found in the lake while sampling for stocked species. Other than these naturally occurring Arctic grayling, numbers of game fish sampled from this gravel pit have been low and have consisted of only a few coho salmon and rainbow trout. Game fish captured in sampling gear were thin compared to the same species in other lakes. When game fish were initially stocked in the 1950's, no lake chubs nor longnose suckers were present. Recently, large numbers of both species have been captured in sampling gear;

Table 17. Richardson Highway 28 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 335.1
Access status:	Road
Endemic species:	Lake chub
Stocked species:	Coho salmon, Arctic char, rainbow trout
Surface area:	3.2 ha
Maximum depth:	3.9 m

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1977	Coho salmon	Clearwater R	Jun 30	5,500	Fingerling	1.03	1976
1979	Coho salmon	Seward Lgn	Jul 19	1,951	Fingerling	3.23	1978
1981	Coho salmon	Seward Lgn	May 19	1,988	Fingerling	1.50	1980
1982	Coho salmon	Bear Cr	Jun 17	2,000	Fingerling	2.04	1981
1984	Coho salmon	Wood Cr	May 25	2,000	Fingerling	3.76	1983
1985	Coho salmon	Wood Cr	May 31	500	Fingerling	3.66	1984
1986	Coho salmon	Wood Cr	Jun 6	500	Fingerling	3.97	1985
1987	Coho salmon	Wood Cr	Jun 1	500	Fingerling	5.21	1986
1988	Arctic char	Aleknagik L	Jun 27	800	Fingerling	4.19	1987
1988	Coho salmon	Wood Cr	Jun 3	800	Fingerling	3.33	1987
1989	Arctic char	Aleknagik L	Jul 20	280	Subcatch.	19.40	1988
1989	Coho salmon	Wood Cr	Jun 6	1,600	Fingerling	4.24	1988
1989	Rainbow trout	Swanson R	Apr 4	500	Subcatch.	16.57	1988
1990	Coho salmon	Big L	Jul 16	500	Fingerling	2.70	1989
1990	Rainbow trout	Swanson R	Jul 24	800	Fingerling	1.60	1990

-continued-

Table 17. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Coho salmon	1	77	(28)	24	(9)	148	(<1)	10	(1)
	Coho salmon	2+	855	(263)	264	(81)	240	(4)		
1988	Arctic char	1	0							
1990										
1989	Coho salmon	1	794	(267)	245	(83)	137	(1)	50	(1)
	Coho salmon	2+	197	(150)	61	(46)	170	(2)		
1989	Arctic char	1	0							
1988	Arctic char	2	3	0	1	0	182	(3)		
1989	Rainbow trout	1	68	(28)	21	(9)	138	(1)	14	(1)

Table 18. Richardson Highway 31 Mile Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 332
Access status:	Road
Endemic species:	Longnose sucker, lake chub
Stocked species:	Coho salmon, Arctic grayling, rainbow trout
Surface area:	7.3 ha
Maximum depth:	6.6 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1967	Arctic grayling	Tolsona L	Jun 14	12,000	Fry	0.01	1967
1969	Arctic grayling	Tolsona L	Jun 10	10,000	Fingerling	0.02	1969
1973	Arctic grayling	Tolsona L	Jun 15	25,000	Fry	0.02	1973
1975	Arctic grayling	Tolsona L	Jun 27	25,000	Fry	0.01	1975
1975	Arctic grayling	Tolsona L	Jun 26	10,000	Fry	0.01	1975
1983	Arctic grayling	Moose L	Jun 2	15,000	Fry	0.02	1983
1984	Arctic grayling	Moose L	Jun 8	15,000	Fry	0.01	1984
1985	Coho salmon	Wood Cr	May 31	500	Fingerling	3.66	1984
1986	Coho salmon	Wood Cr	Jun 6	500	Fingerling	3.97	1985
1986	Rainbow trout	Swanson R	Aug 20	500	Fingerling	1.62	1986
1987	Coho salmon	Wood Cr	Jun 1	500	Fingerling	5.21	1986
1987	Rainbow trout	Swanson R	Aug 27	500	Fingerling	2.16	1987
1988	Arctic char	Aleknagik L	Jun 27	800	Fingerling	4.19	1987
1988	Coho salmon	Wood Cr	Jun 3	800	Fingerling	3.33	1987
1988	Rainbow trout	Swanson R	Aug 16	500	Fingerling	1.08	1988
1989	Arctic char	Aleknagik L	Jul 20	630	Subcatch.	19.40	1988
1989	Coho salmon	Wood Cr	Jun 6	1,600	Fingerling	4.24	1988
1989	Rainbow trout	Swanson R	Aug 7	500	Fingerling	1.20	1989
1990	Arctic grayling	Moose L	Jun 7	10,000	Fry	0.02	1990

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Table 18. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Coho salmon	1	32	(18)	4	(2)	123	(2)	4	(1)
	Coho salmon	2+	13	(7)	2	(1)	182	(4)		
1988	Arctic grayling[a]	1			0		161			
1988	Rainbow trout	1	0		0					
1988	Arctic char	1	0		0					
1990										
1989	Coho salmon	1	0		0					
	Coho salmon	2+	8		1		151	(6)		
	Arctic grayling[a]	2+	8		1		172	(4)		
1989	Rainbow trout	1	0		0					
	Rainbow trout	2+	5		1		167	(10)		
1989	Arctic char	1	0		0					

[a] Arctic grayling were not stocked since 1984, these fish were the result of natural reproduction.

in 1989, more than 6,000 lake chubs and longnose suckers were captured. The 1988 mixed species stocking of Arctic char, coho salmon, and rainbow trout was only moderately successful based upon the estimated density of only 4.0 age 1 game fish per ha in 1989. Mean length of age 1 coho salmon in 1989 was 123 mm. Diversity resulting from the 1988 mixed species stocking was inadequate to provide an added attractant to anglers due to the lack of survival of stocked Arctic char and rainbow trout. The 1989 mixed species stocking of Arctic char, coho salmon, and rainbow trout was judged a failure.

Johnson Road Number 1 Pit:

Johnson Road Number 1 Pit is an abandoned gravel pit located about 1 km down Johnson Road from its intersection with the Richardson Highway at Mile Post 330.4. The surface area is 5.7 ha and maximum depth is 7.3 m (Table 19). Johnson Road Number 1 Gravel Pit was first stocked in 1976 with Arctic grayling sac fry. Arctic grayling were again stocked in 1984, and from 1987 through 1989. Coho salmon and rainbow trout were both stocked from 1986 through 1989. In 1989, 67 burbot were caught and in 1990, 42 burbot were captured in sampling gear. No other species are present. Abundance of game fish prior to 1990 was not estimated due to low catches in sampling gear. In 1990, estimates of abundance of game fish were obtained and is probably due to the combined effects of the stocking of larger Arctic grayling and rainbow trout in 1989 and improved sampling methods used in 1990. The mixed species stocking of coho salmon and rainbow trout in 1986 was a failure. The mixed species stockings of Arctic grayling, coho salmon, and rainbow trout in 1987 and 1988 both failed. The mixed species stocking of Arctic grayling, coho salmon and rainbow trout in 1989 was fully successful based upon an estimated density of 25 age 1 stocked game fish per ha. Mean lengths of age 1 Arctic grayling and rainbow trout in 1990 were 158 and 173 mm, respectively. Species diversity criteria for the 1989 mixed species stocking were not achieved.

Little Harding Lake:

Little Harding Lake is located near Harding Lake and is accessible from the Richardson Highway at Mile Post 321.0. The surface area is 21.9 ha and maximum depth is 10.3 m (Table 20). Little Harding Lake was first stocked in 1963 with fingerling rainbow trout and coho salmon. For brevity, only the stockings occurring since 1967 are presented in Table 20 and only stockings since 1985 are further discussed in the text. From 1985 through 1988, chinook salmon were stocked. Rainbow trout were stocked from 1987 through 1990. Arctic char were stocked in 1988 and 1989. Coho salmon were stocked in 1990. Lake chubs were caught in sampling gear in 1987 for the first time since the lake was last treated with rotenone. In 1989, rainbow trout dominated the population of game fish in Little Harding Lake. A significant portion of the age 1 rainbow trout captured in the fall of 1989 were from the cohort stocked as age 1 sub-catchables just prior to sampling. Thirteen age 1 Arctic char were captured in sampling gear in 1989 and only seven fish of this same cohort were captured in 1990 as age 2 fish. The mixed species stocking of Arctic char, chinook salmon, and rainbow trout in 1988 was fully successful resulting in an estimated density of 58 age 1 game fish per ha. Mean lengths of age 1 Arctic char and rainbow trout in 1989 were 159 and 127 mm, respectively. Species diversity criteria for the 1988 mixed species stocking of Little

Table 19. Johnson Road Number 1 Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 330.4, Johnson Road 0.8 mile
Access status:	Road
Endemic species:	Burbot
Stocked species:	Coho salmon, rainbow trout, Arctic grayling
Surface area:	5.7 ha
Volume:	54,300 m^3
Maximum depth:	7.3 m
Mean depth:	1 m
Alkalinity:	105 mg/L as $CaCO^3$
Morphoedaphic index:	110

Part II. Stocking History

			Specifics concerning stocking cohort					
Year	Species	Brood Stock	Date		Number	Life Stage	Mean Weight (g)	Brood Year
1976	Arctic grayling	Tolsona L	6	28	12,500	Fry	0.02	1976
1984	Arctic grayling	Moose L	6	8	15,000	Fry	0.01	1984
1986	Coho salmon	Wood Cr	6	6	500	Fingerling	3.97	1985
1986	Rainbow trout	Swanson R	8	20	500	Fingerling	1.62	1986
1987	Coho salmon	Wood Cr	6	1	500	Fingerling	5.21	1986
1987	Arctic grayling	Moose L	6	15	10,000	Fry	0.01	1987
1987	Rainbow trout	Swanson R	8	27	500	Fingerling	2.16	1987
1988	Coho salmon	Wood Cr	6	3	500	Fingerling	3.33	1987
1988	Arctic grayling	Moose L	6	14	10,000	Fry	0.02	1988
1988	Rainbow trout	Swanson R	8	16	2,000	Fingerling	1.08	1988
1989	Coho salmon	Wood Cr	6	6	500	Fingerling	4.24	1988
1989	Arctic grayling	Moose L	9	14	1,000	Fingerling	5.36	1989
1989	Rainbow trout	Swanson R	4	4	500	Subcatch.	16.57	1988
1989	Rainbow trout	Swanson R	8	7	2,000	Fingerling	1.20	1989

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Table 19. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Coho salmon	1	0							
1986	Rainbow trout	1	0							
1988										
1987	Arctic grayling	1	0							
	Arctic grayling	2+	38		7[a]					
1987	Coho salmon	1	0							
1987	Rainbow trout	1	0							
1989										
1988	Coho salmon	1	0							
1988	Arctic grayling	1	0							
1988	Rainbow trout	1	0							
	Burbot	2+	67		12		240	(4)		
1990										
1989	Coho salmon	1	0							
1989	Arctic grayling	1	95	(31)	13	(4)	158	(2)	9	(1)
	Arctic grayling	2+	83	(39)	11	(5)	188	(1)		
1989	Rainbow trout	1	90	(27)	12	(4)	173	(1)	4	(<1)
	Rainbow trout	2+	26	(17)	4	(2)	236	(5)		
	Burbot	2+	42				389	(22)		

[a] This is based on fish captured and is a minimum estimate.

Table 20. Little Harding Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 321
Access status:	Road
Endemic species:	Lake chub
Stocked species:	Coho salmon, chinook salmon, rainbow trout, Arctic char
Surface area:	21.9 ha
Maximum depth:	10.3 m
Mean depth:	4.5 m
Alkalinity:	120 mg/L as $CaCO^3$

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1967	Coho salmon	Swanson R	Jul 5	26,400	Fingerling	0.87	1966
1969	Coho salmon	Bear L	Jul 2	34,200	Fingerling	0.66	1968
1970	Coho salmon	ALSEA H	Jun 24	71,500	Fingerling	1.33	1969
1970	Coho salmon	ALSEA H	Jun 23	104,500	Fingerling	1.33	1969
1972	Coho salmon	Delta/Clr R	Aug 29	82,400	Fingerling	1.87	1971
1973	Coho salmon	Green R	Jul 13	39,900	Fingerling	1.03	1972
1974	Coho salmon	Seward Lgn	Aug 28	40,600	Fingerling	3.78	1973
1976	Coho salmon	Blind Slough	Aug 31	24,700	Fingerling	6.30	1975
1976	Coho salmon	Blind Slough	Aug 26	23,700	Fingerling	5.80	1975
1978	Chinook salmon	Salcha R	Jul 6	9,520	Fingerling	9.49	1977
1979	Coho salmon	Seward Lgn	Jul 19	14,746	Fingerling	3.23	1978
1981	Coho salmon	Seward Lgn	May 19	19,885	Fingerling	1.50	1980
1981	Rainbow trout	Talarik Cr	Jul 16	300	Fingerling	1.01	1981
1982	Coho salmon	Bear Cr(Sew)	Jun 8	15,933	Fingerling	1.50	1981
1984	Coho salmon	Wood Cr	May 25	10,000	Fingerling	3.76	1983
1985	Chinook salmon	Crooked Cr	Jun 12	10,245	Smolt	19.60	1984
1986	Chinook salmon	Deshka R	Jun 9	10,000	Fingerling	8.84	1985
1987	Chinook salmon	Clear Cr	Jun 5	10,000	Fingerling	9.48	1987
1987	Rainbow trout	Swanson R	Aug 27	1,000	Fingerling	2.16	1987
1988	Chinook salmon	Crooked Cr	May 19	3,600	Fingerling	8.72	1987
1988	Arctic char	Aleknagik L	Jun 27	3,600	Fingerling	4.20	1987
1988	Rainbow trout	Swanson R	Aug 16	3,600	Fingerling	1.08	1988
1989	Arctic char	Aleknagik L	Jul 20	1,260	Subcatch.	19.40	1988
1989	Rainbow trout	Swanson R	Apr 4	1,000	Subcatch.	16.57	1988
1990	Coho salmon	Big Lake	Jul 16	3,600	Fingerling	2.70	1989
1990	Rainbow trout	Swanson R	Jul 24	1,000	Fingerling	1.60	1990

-continued-

Table 20. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Arctic char	1	13		1		159	(1)		
1988	Chinook salmon	1	0							
	Chinook salmon	2+	28	(5)	1	(<1)	225	(4)		
1988	Rainbow trout	1	1,254	(157)	57	(7)	127	(1)	35	(<1)
1987	Rainbow trout	2	58	(37)	3	(2)	283	(9)		
1990										
1988	Arctic char	1	0							
	Arctic char	2+	7	(0)	0	0	315	(10)		
1989	Rainbow trout	1	0							
	Rainbow trout	2+	168	(52)	8	(2)	297	(6)		

Harding Lake were not achieved due to poor survival of Arctic char and the lack of survival of chinook salmon. The mixed species stocking of Arctic char and rainbow trout in 1989 was a failure. Although these stockings in 1988 failed to provide adequate species diversity based on the established criteria, 43 rainbow trout and 11 Arctic char were estimated to have been harvested in 1989 (Appendix A).

Lost Lake:

Lost Lake is located near Birch Lake and is accessible from the Richardson Highway at Mile Post 306.0. The surface area is 38 ha and maximum depth is 11.8 m (Table 21). Lost Lake was first stocked in 1952 with fingerling rainbow trout. The lake was first treated with rotenone to remove lake chubs and longnose suckers in 1966 and it was treated again with rotenone in the mid-1970's. For brevity, only the stockings since 1966 are summarized in Table 21 and only stockings since 1985 will be further discussed below. Coho salmon were stocked from 1985 through 1989. Rainbow trout were stocked from 1987 through 1990. Arctic char and lake trout were both stocked in 1988 and 1989. In 1989, only age 1 coho salmon were captured in sampling gear. In 1989, age 1 coho salmon abundance was estimated to have been only 134 fish. In 1990, age 1 rainbow trout abundance was estimated to have been only 218 fish. Survival of lake trout and Arctic char was apparently near zero as none were caught in 1989 and only one fish of each species was captured in sampling gear in 1990. In 1989 and 1990, more than 8,000 lake chubs and longnose suckers were captured in sampling gear. The mixed species stockings of Arctic char, coho salmon, lake trout, and rainbow trout in 1988 and 1989 were both judged to have been only moderately successful based upon estimated densities of four and six age 1 game fish in 1989 and 1990, respectively. Mean length of age 1 coho salmon in 1989 was 137 mm. Mean length of age 1 rainbow trout in 1990 was 139 mm. Species diversity criteria for both the 1989 and 1990 mixed species stockings were not achieved. Although the stockings in 1988 failed to provide adequate species diversity, in 1989 there were 33 lake trout and 20 Arctic grayling estimated to have been harvested (Appendix A).

Silver Fox Pit:

Silver Fox Pit is located next to the Richardson Highway at Mile Post 313. The abandoned gravel pit is 2.4 ha in surface area and maximum depth is 4.5 m (Table 22). Silver Fox Pit was first stocked with sheefish in 1981 and was stocked again with sheefish from 1984 through 1987. Lake trout were stocked in 1988 and 1989. Sampling in 1989 and 1990 resulted in no catches of game fish. The single species stockings of lake trout in 1988 and 1989 were both determined to have failed based upon the field sampling program.

Nickel Lake:

Nickel Lake is located on the Fort Greely Military Reservation approximately 15 km south of Delta Junction. The lake is accessible by a 9 km gravel road that intersects the Richardson Highway at Mile Post 256. The surface area of Nickel Lake is 2.0 ha and maximum depth is 10.9 m (Table 23). Nickel Lake was first stocked in 1976 with Arctic grayling sac fry. Arctic grayling were again stocked into Nickel Lake in 1983 and 1985. Rainbow trout fingerlings

Table 21. Lost Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 306, near Birch Lake
Access status:	Road
Endemic species:	Longnose sucker, lake chub
Stocked species:	Rainbow trout, coho salmon, lake trout
Surface area:	38 ha
Maximum depth:	11.8 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1966	Coho salmon	Swanson R	Aug 2	18,800	Fingerling	1.50	1965
1967	Coho salmon	Swanson R	Jul 5	31,200	Fingerling	0.86	1966
1968	Arctic grayling	Tolsona L	Jun 13	30,000	Fry	0.02	1968
1970	Arctic grayling	Tolsona L	Jun 4	75,000	Fry	0.02	1970
1973	Coho salmon	Green R	Jul 11	177,400	Fingerling	1.03	1972
1973	Coho salmon	Green R	Jul 13	23,250	Fingerling	1.03	1972
1976	Arctic grayling	East Pond	May 14	600	Fingerling	9.07	1976
1976	Arctic grayling	East Pond	May 13	3,500	Fingerling	9.07	1976
1977	Coho salmon	Delta/Clr R	Jun 30	60,000	Fingerling	1.03	1976
1979	Coho salmon	Seward Lgn	Jul 19	30,049	Fingerling	3.23	1978
1980	Coho salmon	Ship Cr	May 27	19,990	Fingerling	2.83	1979
1981	Coho salmon	Seward Lgn	May 19	9,890	Fingerling	1.50	1980
1982	Coho salmon	Bear Cr(Sew)	Jun 8	23,784	Fingerling	1.50	1981
1983	Arctic grayling	Moose L	Jun 2	50,000	Fry	0.02	1983
1984	Coho salmon	Wood Cr	May 24	5,000	Fingerling	3.76	1983
1984	Sheefish	Koy-Yuk	Jun 7	5,000	Fingerling	7.30	1983
1985	Coho salmon	Wood Cr	May 31	5,000	Fingerling	3.66	1984
1986	Coho salmon	Wood Cr	Jun 5	10,000	Fingerling	3.97	1985
1987	Coho salmon	Wood Cr	Jun 3	10,000	Fingerling	5.09	1986
1987	Rainbow trout	Swanson R	Sep 2	1,000	Fingerling	2.22	1987
1988	Coho salmon	Wood Cr	May 26	4,700	Fingerling	3.39	1987
1988	Lake trout	Paxson L	Jun 14	4,700	Fingerling	4.13	1987
1988	Lake trout	Paxson L	Jun 14	2,526	Fingerling	4.13	1987
1988	Rainbow trout	Swanson R	Aug 16	4,700	Fingerling	1.08	1988
1988	Arctic char	Aleknagik L	Jun 27	3,600	Fingerling	4.20	1987
1989	Arctic char	Aleknagik L	Jul 20	1,640	Subcatch.	19.40	1988
1989	Coho salmon	Wood Cr	Jun 6	4,700	Fingerling	4.24	1988
1989	Lake trout	Paxson L	Jun 5	4,700	Fingerling	6.31	1988
1989	Lake trout	Paxson L	Aug 18	1,500	Subcatch.	20.48	1988
1989	Rainbow trout	Swanson R	Aug 7	4,700	Fingerling	1.20	1989
1990	Rainbow trout	Swanson R	Jul 24	1,000	Fingerling	1.60	1990

-continued-

Table 21. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Rainbow trout	1	0							
1988	Lake trout	1	0							
1988	Coho salmon	1	134	(4)	4	(<1)	137	(1)	3	(<1)
1988	Arctic char	1	0							
1990										
1989	Rainbow trout	1	218	(66)	6	(2)	139	(3)	5	(<1)
1988	Rainbow trout	2	198	(85)	5	(2)	235	(28)		
1989	Coho salmon	1	0							
1989	Lake trout	1	0							
1988	Lake trout	2	1				226			
1989	Arctic char	1	0							
1988	Arctic char	2	1				218			

Table 22. Silver Fox Pit: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway, Mile Post 313.
Access status:	Road
Endemic species:	Lake chub
Stocked species:	Sheefish, lake trout
Surface area:	2.4 ha
Maximum depth:	4.5 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1981	Sheefish	Koyokuk R	Jun 29	200	Fingerling	1.70	1980
1984	Sheefish	Koy-Yuk R	Jun 7	200	Fingerling	7.30	1983
1985	Sheefish	Yukon R	Jun 13	300	Fingerling	5.90	1984
1986	Sheefish	Yukon R	Aug 7	200	Subcatch.	13.00	1985
1987	Sheefish	Koyokuk R	May 29	400	Subcatch.	11.40	1986
1988	Lake trout	Paxson L	Jun 14	1,200	Fingerling	4.10	1987
1989	Lake trout	Paxson L	Jun 5	1,200	Fingerling	6.30	1988
1989	Lake trout	Paxson L	Aug 18	350	Subcatch.	20.00	1988

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance (SE)	Density in fish per hectare (SE)	Mean length in mm (SE)	Percent survival to age 1 (SE)
1989						
1988	Lake trout	1	0			
1990						
1989	Lake trout	1	0			

Table 23. Nickel Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 256 on Fort Greely
Access status:	Road
Endemic species:	None
Stocked species:	Rainbow trout, lake trout, Arctic grayling
Surface area:	2.0 ha
Maximum depth:	10.9 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1976	Arctic grayling	Tolsona L	Jun 28	25,000	Fry	0.02	1976
1983	Arctic grayling	Moose L	Jun 2	25,000	Fry	0.02	1983
1985	Arctic grayling	Moose L	Jun 25	25,000	Fry	0.02	1985
1986	Rainbow trout	Swanson R	Aug 21	1,000	Fingerling	1.62	1986
1987	Rainbow trout	Swanson R	Aug 25	1,000	Fingerling	1.87	1987
1988	Lake trout	Paxson L	Jun 14	1,000	Fingerling	4.13	1987
1988	Rainbow trout	Swanson R	Aug 17	1,000	Fingerling	1.09	1988
1989	Lake trout	Paxson L	Jun 5	500	Fingerling	6.31	1988
1989	Rainbow trout	Swanson R	Aug 8	500	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
	Arctic grayling	2+	779	(159)	385	(79)	209	(2)		
1988	Rainbow trout	1	517	(88)	255	(44)	114	(1)	52	(1)
	Rainbow trout	2+	375	(97)	185	(48)	204	(1)		
1988	Lake trout	1	0							
1990										
1989	Lake trout	1	86	(40)	43	(20)	169	(2)	16	(1)
1988	Lake trout	2	0							
1989	Rainbow trout	1	55	(13)	27	(6)	158	(8)	11	(1)
	Rainbow trout	2+	88	(21)	42	(10)	206	(3)		
	Arctic grayling	2+	414	(91)	205	(45)	219	(2)		

were stocked annually from 1986 through 1989. Lake trout fingerlings were stocked in 1988 and 1989. Multiple age classes of Arctic grayling were captured in 1989 and 1990 that are the result of natural reproduction of fish stocked in 1976 or 1983. Survival of rainbow trout from stocking to age 1 decreased from 52% in 1989 to 11% in 1990. During the same period, survival of lake trout from stocking to age 1 increased from an apparent value of zero in 1989 to 16% in 1990. No age 2 lake trout were captured in 1990 indicating further evidence that survival of lake trout stocked in 1988 was zero. The mixed species stocking of lake trout and rainbow trout in 1988 and 1989 were both fully successful based upon estimated densities of age 1 game fish the following years (255 and 70 fish per ha respectively). Age 1 rainbow trout averaged 114 and 158 mm in 1989 and 1990 respectively. Age 1 lake trout averaged 169 mm in 1990. The 1988 mixed species stocking of lake trout and rainbow trout failed to provide adequate species diversity to provide an added attractant to anglers due to the lack of survival of lake trout. Although the stockings in 1988 failed to provide adequate species diversity, in 1989 there were 793 rainbow trout and 541 Arctic grayling estimated to have been harvested (Appendix A). The 1989 mixed species stocking of lake trout and rainbow trout fully achieved species diversity criteria.

Rock Hound and No Mercy Lakes:

Rock Hound and No Mercy lakes are located on the Fort Greely Military Reservation south of Delta Junction. These lakes can be accessed by a 1 km trail that starts from the Meadows Road which in turn intersects the Richardson Highway at Mile Post 257.6. Rock Hound and No Mercy lakes are usually joined depending upon water level. Each of the lakes has a surface area of 1.2 ha (Tables 24 and 25). These lakes were first stocked in 1973 with rainbow trout fingerlings. Rainbow trout were stocked in one or the other of these two lakes again in 1987 (both lakes), 1988 (both lakes), and 1989 (Rock Hound Lake only). Lake trout fingerlings were stocked in Rock Hound Lake in 1988 and 1989. No other species of fish are present in either lake. In 1989, over 600 rainbow trout were estimated to be residing in Rock Hound Lake and in 1990, almost 600 rainbow trout were estimated to have been residing in No Mercy Lake. No age 1 lake trout were captured while sampling Rock Hound Lake in 1989 and only a few age 2 lake trout were captured while sampling No Mercy Lake in 1990. Based upon the 1989 sampling program, the mixed species stocking of lake trout and rainbow trout in these lakes was fully successful. Density of age 1 game fish in Rock Hound Lake in 1989 was estimated to have been 23 fish per ha, mean length of age 1 rainbow trout was 116 mm. Based upon the 1990 sampling program in No Mercy Lake, the mixed species stocking of lake trout and rainbow trout into Rock Hound Lake in 1989 was fully successful in that it resulted in an estimated density of 105 age 1 game fish per ha in No Mercy Lake. Mean length of rainbow trout in No Mercy Lake in 1990 was 160 mm. Because of poor survival of lake trout stocked in 1988 and 1989, neither of the two mixed species stockings achieved diversity criteria.

Doc Lake:

Doc Lake is located on the Fort Greely Military Reservation south of Delta Junction. Doc Lake can be reached by the same 1 km trail that is used to

Table 24. Rock Hound Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Fort Greely
Access status:	Trail
Endemic species:	None
Stocked species:	Rainbow trout, lake trout
Surface area:	1.2 ha

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1973	Rainbow trout	Winthrop	Aug 29	1,800	Fingerling	3.87	1973
1987	Rainbow trout	Swanson R	Aug 25	1,500	Fingerling	1.87	1987
1988	Lake trout	Paxson L	Jun 14	600	Fingerling	4.13	1987
1988	Rainbow trout	Swanson R	Aug 17	600	Fingerling	1.09	1988
1989	Lake trout	Paxson L	Jun 5	300	Fingerling	6.31	1988
1989	Rainbow trout	Swanson R	Aug 8	300	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Rainbow trout	1	55	(19)	23	(8)	116	(5)	3	(<1)
1987	Rainbow trout	2	562	(61)	232	(25)	276	(7)		
1988	Lake trout	1	0							

Table 25. No Mercy Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Fort Greely
Access status:	Trail
Endemic species:	None
Stocked species:	Rainbow trout
Surface area:	1.2 ha

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1973	Rainbow trout	Winthrop	Aug 29	1,800	Fingerling	3.87	1973
1987	Rainbow trout	Swanson R	Aug 25	1,500	Fingerling	1.87	1987
1988	Rainbow trout	Swanson R	Aug 17	1,500	Fingerling	1.09	1988

Part III. Recent Fishery Statistics

Sampling Year	Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1990											
	1989	Rainbow trout[a]	1	256	(66)	105	(27)	160	(3)	85	(3)
		Rainbow trout	2+	316	(106)	130	(44)	212	(2)		
	1989	Lake trout[a]	1	0							
	1988	Lake trout[a]	2	3				202	(4)		

[a] These fish were stocked into Rock Hound Lake.

reach No Mercy and Rock Hound lakes. The surface area of Doc Lake is 1.0 ha (Table 26). The lake was first stocked in 1973 with rainbow trout and coho salmon fingerlings. Rainbow trout were again stocked into Doc Lake in 1987, 1988, and 1989. Chinook salmon fingerlings were stocked in 1985. Arctic char were stocked into the lake in 1988 and 1989. No other species of fish are present in the lake. Only rainbow trout were captured in sampling gear in 1989 and 1990. Survival of rainbow trout from stocking to age 1 was 23% for fish stocked in 1988 and was 61% for fish stocked in 1989. The 1988 and 1989 mixed species stockings of Arctic char and rainbow trout into Doc Lake were fully successful based upon estimated densities of age 1 game fish (49 and 131 fish per ha respectively). Mean lengths of age 1 rainbow trout in Doc Lake in 1989 and 1990 were 123 and 135 mm, respectively. Because of poor survival of Arctic char stocked in 1988 and 1989, neither of the two mixed species stockings into Doc Lake achieved desired diversity criteria.

Chet Lake:

Chet Lake is located on the Fort Greely Military Reservation south of Delta Junction. Access to Chet Lake is by a gravel road that intersects the Richardson Highway at Mile Post 256. The surface area of Chet Lake is 3.2 ha (Table 27). The lake was first stocked in 1976 with Arctic grayling sac fry and was again stocked with Arctic grayling in 1985. Rainbow trout fingerlings were stocked annually between 1986 and 1989. Lake trout fingerlings were stocked in 1988 and 1989. Longnose suckers and slimy sculpins are present in Chet Lake and large numbers of these endemic species were caught in sampling gear during 1989 and 1990. Rates of survival of rainbow trout from stocking to age 1 decreased from 60% in 1989 to 1% in 1990. During the same time period, rates of survival for lake trout from stocking to age 1 increased from 1% in 1989 to 51% in 1990. No age 2 lake trout were captured in 1990 although a few fish of this cohort were caught as age 1 fish in 1989. The 1988 and 1989 mixed species stockings of lake trout and rainbow trout were fully successful based upon estimated density of age 1 game fish (297 and 127 fish per ha respectively). Mean lengths of age 1 rainbow trout in Chet Lake in 1989 and 1990 were 103 and 139 mm, respectively. Mean lengths of age 1 lake trout in 1989 and 1990 were 131 and 182 mm, respectively. Because of poor survival of lake trout stocked in 1988 and poor survival of rainbow trout stocked in 1989, neither the 1988 nor 1989 mixed species stockings into Chet Lake achieved desired diversity criteria.

Luke Lake:

Luke Lake is located south of Delta Junction on Fort Greely and access to the lake is by trail. The surface area of Luke Lake is 3.2 ha (Table 28). Luke Lake was first stocked with sac-fry and fingerling Arctic grayling in 1986. In 1987 and 1988, fingerling Arctic grayling were stocked in the lake. In 1988, fingerling Arctic char were stocked and in 1989, fingerling rainbow trout were stocked. No endemic fish species reside in Luke Lake. Abundance of age 1 Arctic grayling was estimated to have been 382 fish in 1987. So few fish were caught during sampling in 1989 and 1990, that abundance of age 1 Arctic grayling, Arctic char, and rainbow trout could not be estimated. Apparently, a winter-kill in 1988-89 occurred and the game fish population was decimated. The single species stocking of Arctic grayling in 1987 was fully

Table 26. Doc Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Fort Greely
Access status:	Trail
Endemic species:	None
Stocked species:	Rainbow trout, chinook salmon, Arctic char
Surface area:	1 ha

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1973	Rainbow trout	Winthrop	Aug 29	1,200	Fingerling	4.87	1973
1973	Coho Salmon	Lake Rose	Sep 20	1,200	Fingerling	4.98	1972
1985	Chinook salmon	Crooked Cr	Jun 18	200	Smolt	19.90	1984
1987	Rainbow trout	Swanson R	Aug 25	1,500	Fingerling	1.87	1987
1988	Arctic char	Aleknagik L	Jun 28	520	Fingerling	4.22	1987
1988	Rainbow trout	Swanson R	Aug 17	520	Fingerling	1.09	1988
1989	Arctic char	Aleknagik L	Jul 19	100	Subcatch.	20.00	1988
1989	Rainbow trout	Swanson R	Aug 8	520	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Arctic char	1	0							
1988	Rainbow trout	1	119	(39)	49	(16)	123	(2)	23	(1)
1987	Rainbow trout	2	905	(180)	373	(74)	209	(1)		
1990										
1989	Arctic char	1	0							
1989	Rainbow trout	1	319	(71)	131	(29)	135	(2)	61	(2)
	Rainbow trout	2+	1,000	(223)	412	(92)	207	(2)		

Table 27. Chet Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Fort Greely
Access status:	Road
Endemic species:	Longnose sucker, slimy sculpin
Stocked species:	Arctic grayling, lake trout, rainbow trout
Surface area:	3.2 ha

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1976	Arctic grayling	Tolsona L	Jun 28	25,000	Fry	0.02	1976
1985	Arctic grayling	Moose L	Jun 25	25,000	Fry	0.02	1985
1986	Rainbow trout	Swanson R	Aug 21	1,000	Fingerling	1.62	1986
1987	Rainbow trout	Swanson R	Aug 25	1,000	Fingerling	1.87	1987
1988	Lake trout	Paxson L	Jun 14	1,600	Fingerling	4.13	1987
1988	Rainbow trout	Swanson R	Aug 17	1,600	Fingerling	1.09	1988
1989	Lake trout	Paxson L	Jun 5	800	Fingerling	6.31	1988
1989	Rainbow trout	Swanson R	Aug 8	800	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Lake trout	1	12	(0)	4	(0)	131	(3)	1	(0)
1988	Rainbow trout	1	949	(285)	293	(88)	103	(3)	60	(1)
1987	Rainbow trout	2+	244	(164)	75	(51)	208	(5)		
1990										
1989	Lake trout	1	406	(87)	125	(27)	182	(1)	51	(1)
1988	Lake trout	2	0							
1989	Rainbow trout	1	6	(2)	2	(1)	139	(4)	1	(<1)
1988	Rainbow trout	2+	7	(2)	2	(1)	217	(6)		
	Arctic grayling	2+	69	(21)	21	(7)	238	(6)		

Table 28. Luke Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Fort Greely
Access status:	Trail
Endemic species:	None
Stocked species:	Arctic grayling, Arctic char, rainbow trout
Surface area:	3.2 ha

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1986	Arctic grayling	Moose Cr	Sep 24	500	Fingerling	6.15	1986
1986	Arctic grayling	Moose Cr	Sep 9	500	Fingerling	4.70	1986
1986	Arctic grayling	Moose Cr	Jun 11	10,000	Fry	0.02	1986
1987	Arctic grayling	Moose Cr	Aug 26	500	Fingerling	3.43	1987
1988	Arctic char	Aleknagik L	Jun 28	600	Fingerling	4.22	1987
1988	Arctic grayling	Moose L	Sep 12	600	Fingerling	3.96	1988
1989	Rainbow trout	Swanson R	Aug 8	1,600	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance (SE)	Density in fish per hectare (SE)	Mean length in mm (SE)	Percent survival to age 1 (SE)
1988						
1987	Arctic grayling	1	382 (121)	118 (37)	129 (7)	76 (2)
1989						
1988	Arctic grayling	1	0			
1988	Arctic char	1	0			
1990						
1989	Rainbow trout	1	0			

successful (estimated density of age 1 game fish = 118 fish per ha). Age 1 Arctic grayling averaged 129 mm in 1988. The mixed species stocking of Arctic char and Arctic grayling in 1988 failed and the single species stocking of rainbow trout in 1989 failed.

Sheefish Lake:

Sheefish Lake is located on Fort Greely south of Delta Junction. A trail provides access to the lake. Surface area of Sheefish Lake is 3.2 ha (Table 29). In 1986, Arctic grayling sac fry and fingerlings were stocked into Sheefish Lake. In 1987, sac fry Arctic grayling were stocked and the following year, fingerling Arctic grayling were stocked. Lake trout fingerlings were stocked in 1988 and 1989. Slimy sculpins are the only endemic fish species in this small lake. Abundance of Arctic grayling was estimated to have been 363 fish in 1989 and 127 fish in 1990. Only a few lake trout were captured during sampling that took place in 1989 and 1990. The mixed species stocking of Arctic grayling and lake trout in 1988 was moderately successful with the estimated density of age 1 game fish being only 12 fish per ha in 1989. Mean length of age 1 lake trout in 1989 was 117 mm. Mean length of age 1 Arctic grayling in 1989 was 140 mm. Although abundance of age 1 game fish in 1989 was only moderate, species diversity criteria were fully achieved. The single species stocking of lake trout in 1989 failed to meet minimum desired density of age 1 game fish the following year. Mean length of the few age lake trout captured in 1990 was 161 mm.

Bullwinkle Lake:

Bullwinkle Lake is located south of Delta Junction on Fort Greely and is accessible by trail. The lake is 1.6 ha in surface area (Table 30). Bullwinkle Lake was first stocked in 1984 with fingerling sheefish. Fingerling rainbow trout were stocked in Bullwinkle Lake from 1987 through 1989. In 1989, fingerling lake trout were stocked. Sampling in 1988 and 1989 resulted in few game fish being caught. The single species stocking of rainbow trout in 1988 failed. The mixed species stocking of lake trout and rainbow trout in 1989 was moderately successful with a resultant density of age 1 game fish estimated to have been at least 3.7 fish per ha (although too few fish were caught to estimate abundance, six age 1 game fish were caught). Age 1 lake trout averaged 167 mm and age 1 rainbow trout averaged 159 mm in 1990. Although density of age 1 game fish in Bullwinkle Lake during 1990 was only moderate, species diversity criteria were fully achieved.

Ghost Lake:

Ghost Lake is located on Fort Greely south of Delta Junction. Access to Ghost Lake is by a 1 km trail that is reached by a 10 km gravel road that intersects the Richardson Highway at Mile Post 256. The lake is 2.0 ha in surface area (Table 31). Ghost Lake was first stocked in 1987 with fingerling rainbow trout. In 1988 and 1989, fingerling rainbow trout and lake trout were stocked. Abundance of rainbow trout in Ghost Lake was estimated to have been 70 fish in 1989 and 115 fish in 1990. Only one lake trout was captured in 1989. In 1990, lake trout abundance was estimated to have been 59 fish, mostly 2 year olds from the 1988 stocking. The mixed species stocking of lake

Table 29. Sheefish Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Fort Greely
Access status:	Trail
Endemic species:	Slimy sculpin
Stocked species:	Arctic grayling, lake trout
Surface area:	3.2 ha

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1986	Arctic grayling	Moose L	9 24	500	Fingerling	6.15	1986
1986	Arctic grayling	Moose L	9 5	500	Fingerling	4.70	1986
1986	Arctic grayling	Moose L	6 11	10,000	Fry	0.02	1986
1987	Arctic grayling	Moose L	6 15	10,000	Fry	0.01	1987
1988	Arctic grayling	Moose L	9 12	800	Fingerling	3.96	1988
1988	Lake trout	Paxson L	6 14	800	Fingerling	4.13	1987
1989	Lake trout	Paxson L	6 5	800	Fingerling	6.31	1988

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Lake trout	1	9		3		117	(8)		
1988	Arctic grayling	1	30	(21)	9	(7)	140	(3)	4	(1)
1987	Arctic grayling	2+	333	(59)	103	(18)	212	(5)		
1990										
1989	Lake trout	1	4	(2)	1	(1)	161	(6)	1	(<1)
1988	Lake trout	2+	6	(2)	2	(1)	215	(21)		
1988	Arctic grayling	2+	127	(18)	39	(6)	210	(3)		

Table 30. Bullwinkle Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Fort Greely
Access status:	Trail
Endemic species:	None
Stocked species:	Sheefish, rainbow trout, lake trout
Surface area:	1.6 ha

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1984	Sheefish	Koy-Yuk	8 13	1,000	Fingerling	3.20	1983
1987	Rainbow trout	Swanson R	8 25	800	Fingerling	1.87	1987
1988	Rainbow trout	Swanson R	8 17	800	Fingerling	1.09	1988
1989	Lake trout	Paxson L	6 5	400	Fingerling	6.31	1988
1989	Rainbow trout	Swanson R	8 8	400	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance (SE)	Density in fish per hectare (SE)	Mean length in mm (SE)	Percent survival to age 1 (SE)
1989						
1988	Rainbow trout	1	0			
1990						
1989	Rainbow trout	1	3	2	159 (4)	1 (1)
1989	Lake trout	1	3	2	167 (3)	1 (0)
	Lake trout	2+	20	13	271 (17)	

Table 31. Ghost Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Fort Greely
Access status:	Trail
Endemic species:	None
Stocked species:	Lake trout, rainbow trout
Surface area:	2.0 ha

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1987	Rainbow trout	Swanson R	Aug 25	1,000	Fingerling	1.87	1987
1988	Lake trout	Paxson L	Jun 14	1,000	Fingerling	4.13	1987
1988	Rainbow trout	Swanson R	Aug 17	1,000	Fingerling	1.09	1988
1989	Lake trout	Paxson L	Jun 5	500	Fingerling	6.31	1988
1989	Rainbow trout	Swanson R	Aug 8	500	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Lake trout	1	1[a]		0.5		177			
1988	Rainbow trout	1	51	(12)	25	(6)	152	(1)	5	(<1)
1987	Rainbow trout	2	19	(9)	9	(4)	234	(3)		
1990										
1989	Lake trout	1	11	(6)	2	(1)	138	(10)	2	(1)
1988	Lake trout	2	48	(21)	10	(4)	196	(3)		
1989	Rainbow trout	1	67	(26)	13	(5)	139	(2)	13	(1)
	Rainbow trout	2+	48	(28)	10	(6)	200	(5)		

[a] This is based on fish captured and is a minimum estimate.

trout and rainbow trout in Ghost Lake in 1988 was fully successful in terms of density of age 1 game fish, however diversity criteria were not achieved. In 1989, mean length of age 1 rainbow trout was 152 mm. Although diversity criteria were achieved for the 1989 mixed species stocking of lake trout and rainbow trout, success was only moderate in that density of age 1 game fish in 1990 was estimated to have only been 15 fish per ha. Mean lengths of age 1 lake trout and rainbow trout in 1990 were 138 and 139 mm, respectively.

Bolio Lake:

Bolio Lake is located south of Delta Junction on Fort Greely along the Meadows Road. The lake can be accessed by a 4 km gravel road. Surface area is 56 ha and maximum depth is 5.5 m (Table 32). Bolio Lake was first stocked in 1966 with coho salmon. Coho salmon were again stocked in 1968, 1971, 1973, 1975, and 1977. Arctic grayling were stocked in 1981, 1983, 1984, and from 1987 through 1990. Chinook salmon were stocked from 1986 through 1988. Lake trout were stocked in 1988. Sampling in 1989 resulted in zero catches. In 1990, abundance of age 1 Arctic grayling was estimated to have been 71 fish and they averaged only 67 mm in length. The 1988 mixed species stocking of Arctic grayling, chinook salmon, and lake trout and the 1989 single species stocking of Arctic grayling were both failures.

North Twin Lake:

North Twin Lake is located south of Delta Junction on Fort Greely and is accessible from the Meadow Road which intersects the Richardson Highway at Mile Post 257.6. The lake is 8.1 ha in surface area and maximum depth is 12.4 m (Table 33). North Twin Lake was first stocked in 1966 with fingerling rainbow trout and has been stocked with rainbow trout fingerlings in 1975, 1982, 1983, and 1986 through 1989. Coho salmon were stocked in 1978. Chinook salmon were stocked into North Twin Lake in 1985. The lake was sampled in 1987 and abundance of age 1 rainbow trout was estimated to have been 1,664 fish. Mean length of age 1 rainbow trout in 1987 was 124 mm. The single species stocking of rainbow trout into North Twin Lake in 1986 was fully successful. The lake has not been sampled since 1986, but anglers have reported that fishable populations of rainbow trout resided in the lake from 1987 through 1990.

South Twin Lake:

South Twin Lake is located near North Twin Lake (location described above). The lake has a surface area of 8.1 ha and a maximum depth of 7.0 m (Table 34). South Twin Lake was first stocked in 1966 with fingerling rainbow trout. Coho salmon were stocked in South Twin Lake in 1973, 1976, 1978 and 1980. Rainbow trout fingerlings were again stocked in 1982 and from 1986 through 1989. Chinook salmon smolt were stocked into South Twin Lake in 1985. Sampling in 1987 provided an abundance estimate of 3,320 age 1 rainbow trout in this lake. The single species stocking of rainbow trout in South Twin Lake in 1986 was fully successful and resulted in a density of age 1 game fish that was estimated to have been 410 fish per ha. Mean length of age 1 rainbow trout in 1987 was 189 mm. Although the lake has not been sampled since 1987, anglers report that fishable populations of rainbow trout have resided in South Twin

Table 32. Bolio Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 257.6, Meadows Road Mile Post 2
Access status:	Road
Endemic species:	None
Stocked species:	Arctic grayling, coho salmon, chinook salmon, lake trout
Surface area:	56 ha
Maximum depth:	5.5 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1966	Coho salmon	Swanson R	Aug 2	19,500	Fingerling	1.50	1965
1968	Coho salmon	Lk Rose Tead	Jul 8	19,900	Fingerling	0.74	1967
1971	Coho salmon	Lake Miam	Jun 24	19,900	Fingerling	1.30	1970
1973	Coho salmon	Green R	Jul 13	10,000	Fingerling	1.03	1972
1975	Coho salmon	Bear L	Jul 17	11,800	Fingerling	1.23	1974
1977	Coho salmon	Delta/Clr R	Jun 30	10,000	Fingerling	1.03	1976
1981	Arctic grayling	Junction L	Jun 11	50,545	Fry	0.02	1981
1983	Arctic grayling	Moose L	Jun 2	50,000	Fry	0.02	1983
1984	Arctic grayling	Moose L	Jun 11	50,000	Fry	0.01	1984
1986	Chinook salmon	Deshka R	Jun 9	20,500	Fingerling	8.84	1985
1987	Chinook salmon	Clear Cr	Jun 5	1,718	Fingerling	9.48	1987
1987	Chinook salmon	Clear Cr	Jun 2	20,000	Fingerling	9.72	1987
1987	Arctic grayling	Moose L	Jun 15	20,000	Fry	0.01	1987
1988	Chinook salmon	Crooked Cr	May 19	13,130	Fingerling	8.72	1987
1988	Arctic grayling	Moose L	Jun 14	20,000	Fry	0.02	1988
1988	Lake trout	Paxson L	Jun 14	14,900	Fingerling	4.13	1987
1989	Arctic grayling	Moose L	Jun 13	20,000	Fry	0.02	1989
1990	Arctic grayling	Moose L	Jun 6	20,000	Fry	0.02	1990

-continued-

Table 32. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance (SE)	Density in fish per hectare (SE)	Mean length in mm (SE)	Percent survival to age 1 (SE)
1989						
1988	Arctic grayling	1	0			
1988	Chinook salmon	1	0			
1988	Lake trout	1	0			
1990						
1989	Arctic grayling	1	71[a]	1	67 (<1)	(<1) (0)
	Arctic grayling	2+	2		208 (3)	

[a] This is based on fish captured and is a minimum estimate.

Table 33. North Twin Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 257.6, Meadows Road Mile Post 5.6
Access status:	Road
Endemic species:	None
Stocked species:	Rainbow trout, chinook salmon, coho salmon
Surface area:	8.1 ha
Maximum depth:	12.4 m

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1966	Rainbow trout	Winthrop	Aug 2	5,000	Fingerling	1.13	1966
1975	Rainbow trout	Ennis	Jul 24	15,000	Fingerling	2.65	1975
1978	Coho salmon	Seward Lgn	Aug 15	6,000	Fingerling	3.13	1977
1982	Rainbow trout	Swanson R	Sep 16	6,000	Fingerling	3.24	1982
1983	Rainbow trout	Swanson R	Sep 14	4,000	Fingerling	1.55	1983
1985	Chinook salmon	Crooked Cr	Jun 18	1,000	Smolt	19.90	1984
1986	Rainbow trout	Swanson R	Aug 21	4,000	Fingerling	1.62	1986
1987	Rainbow trout	Swanson R	Aug 25	4,000	Fingerling	1.87	1987
1988	Rainbow trout	Swanson R	Aug 17	4,000	Fingerling	1.09	1988
1989	Rainbow trout	Swanson R	Aug 8	2,000	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance (SE)	Density in fish per hectare (SE)	Mean length in mm (SE)	Percent survival to age 1 (SE)
1987						
1986	Rainbow trout	1	1,664 (135)	206 (17)	124 (2)	42 (1)

Table 34. South Twin Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 257.6, Meadows Road Mile Post 5.6
Access status:	Road
Endemic species:	None
Stocked species:	Rainbow trout, coho salmon, chinook salmon
Surface area:	8.1 ha
Maximum depth:	7.0 m
Alkalinity:	68 mg/L as $CaCO^3$

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1966	Rainbow trout	Winthrop	Aug 2	4,000	Fingerling	1.13	1966
1973	Coho salmon	Lake Rose	Sep 20	6,300	Fingerling	4.98	1972
1976	Coho salmon	Blind Slough	Aug 24	6,000	Fingerling	5.80	1975
1978	Coho salmon	Seward Lgn	Aug 15	6,000	Fingerling	6.72	1977
1980	Coho salmon	Ship Cr	May 27	4,990	Fingerling	2.83	1979
1982	Rainbow trout	Swanson R	Sep 16	4,000	Fingerling	3.24	1982
1985	Chinook salmon	Crooked Cr	Jun 18	500	Smolt	19.90	1984
1986	Rainbow trout	Swanson R	Aug 21	4,000	Fingerling	1.62	1986
1987	Rainbow trout	Swanson R	Aug 25	4,000	Fingerling	1.97	1987
1988	Rainbow trout	Swanson R	Aug 17	4,000	Fingerling	1.09	1988
1989	Rainbow trout	Swanson R	Aug 8	4,000	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance (SE)	Density in fish per hectare (SE)	Mean length in mm (SE)	Percent survival to age 1 (SE)
1987						
1986	Rainbow trout	1	3,320 (343)	410 (42)	189 (2)	83 (3)

Lake since 1986 and the annual stocking program 1987 through 1989 is assumed to have been successful.

Coal Mine Road Pond Number 5:

Coal Mine Road Pond Number 5 is located south of Delta Junction. The lake is accessible from the Coal Mine Road which intersects the Richardson Highway at Mile Post 242. The pond is 5.3 ha in surface area and has a maximum depth of 3.6 m (Table 35). The pond was first stocked in 1981 with coho salmon fingerlings. Fingerling lake trout were stocked in 1988 and 1989. Also in 1989, fingerling rainbow trout were stocked. Sampling in 1989 failed to result in the capture of lake trout stocked in 1988. Rainbow trout and lake trout populations were estimated in 1990 with the combined game fish population estimated at 436 fish. Mean lengths of age 1 lake trout and rainbow trout in 1990 were 147 and 136 mm, respectively. Although age 1 lake trout were not caught in 1989, the density of this same cohort at age 2 in 1990 was estimated to have been 18 fish per ha, close to the lower criteria for a fully successful density of game fish at age 1. Hence, the single species stocking of lake trout into this pond in 1988 was judged to have been fully successful. Based upon the mean length at age 2 of lake trout caught in 1990 (241 mm), it is assumed that this cohort exceeded 100 mm at age 1. The mixed species stocking of lake trout and rainbow trout in 1989 was judged to have been fully successful and species diversity criteria were achieved. Mean lengths of age 1 lake trout and rainbow trout in 1990 were 147 and 136 mm, respectively.

Ken's Pond:

Ken's Pond is also located south of Delta Junction along the Coal Mine Road. Surface area of Ken's Pond is 2.0 ha and maximum depth is 4.5 m (Table 36). Ken's Pond was first stocked in 1987 with fingerling Arctic char and rainbow trout. Fingerlings of these two species were stocked in Ken's Pond again in 1988 and 1989. Sampling from 1988 through 1990 revealed that fish of all six stocking cohorts had survived to age 1. Mean lengths of age 1 Arctic char in 1988, 1989, and 1990 were 224, 134, and 149 mm, respectively. Mean lengths of age 1 rainbow trout in 1988, 1989, and 1990 were 142, 152, and 142 mm, respectively. Anglers have reported catching both rainbow trout and Arctic char in Ken's Pond each year since 1988. The mixed species stocking of Arctic char and rainbow trout in Ken's Pond in all three years was fully successful. Diversity criteria were fully achieved with the 1989 mixed species stocking and were nearly achieved with the 1988 and 1990 mixed species stockings.

Backdown Lake:

Backdown Lake is located south of Delta Junction along the Coal Mine Road. The lake has a surface area of 2.4 ha and has a maximum depth of 3.6 m (Table 37). Backdown Lake was first stocked in 1987 with fingerling Arctic char and rainbow trout. It was similarly stocked in 1988 and 1989. Abundance of Arctic char and rainbow trout has been estimated annually from 1988 through 1990. Survival of rainbow trout stocked as fingerlings from stocking to age 1 has ranged from 29 to 53% and survival of Arctic char from stocking to age 1 has ranged from 1 to 77%. A trend of decreasing survival of Arctic char has

Table 35. Coal Mine Road Number 5: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 242, Coal Mine Road Mile Post 1.6
Access status:	Road
Endemic species:	None
Stocked species:	Coho salmon, rainbow trout, lake trout
Surface area:	5.3 ha
Maximum depth:	3.6 m

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1981	Coho salmon	Seward	May 14	2,994	Fingerling	1.21	1980
1988	Lake trout	Paxson	Jun 14	2,600	Fingerling	4.13	1987
1989	Lake trout	Paxson	Jun 5	2,600	Fingerling	6.31	1988
1989	Rainbow trout	Swanson	Aug 8	2,600	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Lake trout	1	0							
	Coho salmon	2+	20[a]		4		357	(6)		
1990										
1989	Rainbow trout	1	148	(24)	28	(5)	136	(2)	6	(<1)
1989	Lake trout	1	193	(56)	37	(11)	147	(3)	7	(<1)
1988	Lake trout	2	95	(48)	18	(9)	241	(5)		

[a] This is based on fish captured and is a minimum estimate.

Table 36. Ken's Pond: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 242, Coal Mine Road Mile Post 4.7
Access status:	Road
Endemic species:	None
Stocked species:	Arctic char, rainbow trout
Surface area:	2.0 ha
Maximum depth:	4.5 m

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1987	Arctic char	Aleknagik	Jun 18	155	Fingerling	4.33	1986
1987	Rainbow trout	Swanson	Aug 25	600	Fingerling	1.87	1987
1988	Arctic char	Aleknagik	Jun 28	1,000	Fingerling	4.22	1987
1988	Rainbow trout	Swanson	Aug 17	1,000	Fingerling	1.09	1988
1989	Arctic char	Aleknagik	Jul 19	100	Fingerling	20.00	1988
1989	Rainbow trout	Swanson	Aug 8	500	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1988										
1987	Arctic char	1	34[a]		17		224	(5)		
1987	Rainbow trout	1	360	(41)	178	(20)	142	(2)	60	(1)
1989										
1988	Arctic char	1	408	(154)	202	(76)	134	(1)	41	(1)
1987	Arctic char	2	144	(108)	71	(53)	245	(4)		
1988	Rainbow trout	1	274	(36)	135	(18)	152	(2)	27	(1)
1987	Rainbow trout	2	133	(32)	66	(16)	226	(5)		
1990										
1989	Rainbow trout	1	55	(17)	27	(9)	142	(4)	55	(4)
	Rainbow trout	2+	169	(50)	83	(25)	214	(4)		
1989	Arctic char	1	4	(2)	2	(1)	149	(27)	1	(<1)
	Arctic char	2+	27	(2)	13	(1)	228	(6)		

[a] This is based on fish captured and is a minimum estimate.

Table 37. Backdown Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 242, Coal Mine Road Mile Post 1.6
Access status:	Road
Endemic species:	None
Stocked species:	Rainbow trout, Arctic char
Surface area:	2.4 ha
Maximum depth:	3.6 m

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1987	Arctic char	Aleknagik	Jun 18	600	Fingerling	4.33	1986
1987	Rainbow trout	Swanson	Aug 25	500	Fingerling	1.87	1987
1988	Arctic char	Aleknagik	Jun 28	1,200	Fingerling	4.22	1987
1988	Rainbow trout	Swanson	Aug 17	1,200	Fingerling	1.09	1988
1989	Arctic char	Aleknagik	Jul 19	126	Subcatch.	20.00	1988
1989	Rainbow trout	Swanson	Aug 8	600	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1988										
1987	Rainbow trout	1	182	(21)	75	(9)	138	(2)	30	(1)
1987	Arctic char	1	462	(53)	190	(22)	174	(6)	77	(1)
1989										
1988	Arctic char	1	185	(65)	76	(27)	132	(3)	15	(1)
1987	Arctic char	2	542	(178)	223	(73)	219	(3)		
1988	Rainbow trout	1	345	(104)	142	(43)	149	(2)	29	(1)
1987	Rainbow trout	2	118	(73)	49	(30)	222	(2)		
1990										
1989	Arctic char	1	10	(3)	4	(1)	181	(4)	1	(<1)
	Arctic char	2+	28	(3)	12	(1)	224	(3)		
1989	Rainbow trout	1	66	(22)	27	(9)	131	(3)	53	(4)
	Rainbow trout	2+	162	(56)	67	(23)	201	(8)		

occurred. Mean lengths of age 1 Arctic char in 1988, 1989, and 1990 were 174, 132, and 181 mm, respectively. Mean lengths of age 1 rainbow trout in 1988, 1989, and 1990 were 138, 149, and 131 mm, respectively. Densities of age 1 game fish in Backdown Lake in 1988, 1989, and 1990 were estimated to have been 265, 218, and 31 fish per ha, respectively. The mixed species stockings of Arctic char and rainbow trout into Backdown Lake in 1987, 1988, and 1990 were all fully successful and species diversity criteria were achieved with all three mixed species stockings.

Brodie Lake:

Brodie Lake is located south of Delta Junction and is accessible from the Coal Mine Road. Brodie Lake is 2.0 ha in surface area and has a maximum depth of 5.3 m (Table 38). Arctic char were stocked into Brodie Lake from 1987 through 1989. Slimy sculpin are endemic to the lake and Arctic grayling were found in the lake during sampling although they have not been stocked in this lake by ADFG. Abundance of Arctic char in Brodie Lake in 1988, 1989, and 1990 was estimated to have been 596, 452, and 38 fish, respectively. A trend of decreasing survival of Arctic char from stocking to age 1 is evident from the sampling program. Mean length at age 1 for Arctic char stocked into Brodie Lake in 1987, 1988, and 1989 was 141, 134, and 153 mm, respectively. The single species stocking of Arctic char in 1987 and 1988 was fully successful, whereas, the stocking of Arctic char in 1989 was only moderately successful.

Last Lake:

Last Lake is also located south of Delta Junction along the Coal Mine Road. Last Lake is 2.0 ha in surface area and has a maximum depth is 3.3 m (Table 39). Last Lake was stocked with Arctic char from 1987 through 1989. Sampling in 1988 and 1989 revealed that 282 and 305 Arctic char were residing in the lake in those years, respectively. Sampling in 1990 only resulted in the capture of a few Arctic char. As in other nearby lakes, survival rate of Arctic char from stocking to age 1 has been decreasing. Mean lengths of age 1 Arctic char in 1988 and 1989 were 186 and 133 mm, respectively. Only one age 1 Arctic char was captured in 1990 and it exceeded 100 mm in length. The single species stockings of Arctic char into Last Lake in 1987 and 1988 were fully successful, whereas, the 1989 stocking failed.

Paul's Pond:

Paul's Pond is located south of Delta Junction and is accessible from the Coal Mine Road. The pond has a surface area of 2.0 ha (Table 40). Paul's Pond was first stocked in 1978 with Arctic grayling sac fry and in 1985, was again stocked with these fish. In 1988 and 1989, lake trout fingerlings were stocked. In 1989, rainbow trout fingerlings were stocked in Paul's Pond. Sampling in 1989 revealed adequately dense populations of both Arctic grayling and lake trout to support a sport fishery. Abundance of Arctic grayling was estimated to have been 137 fish and abundance of lake trout was estimated to have been 456 age 1 fish. Most of the Arctic grayling sampled in 1989 were the result of natural reproduction of fish previously stocked. Sampling in 1990 provided an abundance estimate of 455 lake trout and only a few Arctic grayling were caught. Rainbow trout stocked in 1989 were not captured in

Table 38. Brodie Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 242, Coal Mine Road Mile Post 2.1
Access status:	Road
Endemic species:	Slimy sculpin
Stocked species:	Arctic grayling, Arctic char
Other species:	Arctic grayling
Surface area:	2.0 ha
Maximum depth:	5.3 m

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1987	Arctic char	Aleknagik	Jun 18	1,000	Fingerling	4.33	1986
1988	Arctic char	Aleknagik	Jun 28	1,000	Fingerling	4.22	1987
1989	Arctic char	Aleknagik	Jul 19	350	Subcatch.	20.00	1988

Part III. Recent Fishery Statistics

Sampling Year	Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1988											
	1987	Arctic char	1	596	(156)	295	(77)	141	(6)	60	(1)
	1987	Arctic grayling[a]	1	1,271	(202)	628	(100)	150	(1)		
1989											
	1988	Arctic char	1	243	(113)	120	(56)	134	(6)	24	(1)
	1987	Arctic char	2	209	(139)	103	(69)	193	(15)		
1990											
	1989	Arctic char	1	18	(9)	9	(5)	153	(4)	5	(1)
		Arctic char	2+	20	(13)	10	(6)	184	(4)		
		Arctic grayling[a]	2+	642	(198)	317	(98)	172	(1)		

[a] There is no record of Arctic grayling having been stocked in Brodie Lake. Arctic grayling are not endemic to Brodie Lake.

Table 39. Last Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 242, Coal Mine Road Mile Post 1.9
Access status:	Road
Endemic species:	None
Stocked species:	Arctic char
Surface area:	2.0 ha
Maximum depth:	3.3 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1987	Arctic char	Aleknagik	Jun 18	500	Fingerling	4.33	1986
1988	Arctic char	Aleknagik	Jun 28	500	Fingerling	4.22	1987
1989	Arctic char	Aleknagik	Jul 19	589	Subcatch.	20.00	1988

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1988										
1987	Arctic char	1	282	(29)	139	(14)	186	(3)	56	(1)
1989										
1988	Arctic char	1	144	(26)	71	(13)	133	(2)	29	(1)
1987	Arctic char	2	161	(34)	79	(17)	227	(3)		
1990										
1989	Arctic char	1	1		<1		164	(7)		
	Arctic char	2+	3	(1)	1	(1)	192	(13)		

Table 40. Paul's Pond: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 242, Coal Mine Road Mile Post 2.6
Access status:	Road
Endemic species:	Slimy sculpin
Stocked species:	Arctic grayling, rainbow trout, lake trout
Other species:	Arctic grayling
Surface area:	2.0 ha

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1978	Arctic grayling	Tolsona	Jun 12	25,000	Fry	0.01	1978
1985	Arctic grayling	Moose	Jun 25	15,000	Fry	0.02	1985
1988	Lake trout	Paxson	Jun 14	1,000	Fingerling	4.13	1987
1989	Lake trout	Paxson	Jun 5	1,000	Fingerling	6.31	1988
1989	Rainbow trout	Swanson	Aug 8	500	Fingerling	1.06	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1989										
1988	Lake trout	1	456	(224)	225	(111)	130	(1)	46	(2)
1988	Arctic grayling[a]	1	41	(9)	20	(5)	98	(<1)		
	Arctic grayling	2+	96	(18)	47	(9)	236	(8)		
1990										
1989	Rainbow trout	1	0							
1989	Lake trout	1	121	(35)	60	(18)	133	(2)	12	(1)
1988	Lake trout	2	334	(102)	165	(50)	186	(2)		
	Arctic grayling	2+	4		2		213	(38)		

[a] These age 1 fish was the result of natural reproduction.

1990. Mean lengths of age 1 lake trout in 1989 and 1990 were 130 and 133 mm, respectively. The single species stocking of lake trout into Paul's Pond in 1988 was fully successful. The mixed species stocking of lake trout and rainbow trout in 1989 was fully successful in that density of stocked age 1 game fish the following year was estimated to have been 60 fish per ha. Species diversity criteria for the 1989 mixed species stocking of Paul's Pond were not achieved due to the lack of survival of stocked rainbow trout.

Rangeview Lake:

Rangeview Lake is also located south of Delta Junction and is accessed by the Coal Mine Road. Rangeview Lake is 1.8 ha in surface area and has a maximum depth of 2.7 m (Table 41). Arctic char were stocked into Rangeview Lake from 1987 through 1989. Sampling in 1988, 1989, and 1990 revealed that abundance of Arctic char in Rangeview Lake was 337, 778, and 242 fish, respectively. In 1990, a few Arctic grayling and lake trout were also caught in Rangeview Lake. These species were not stocked into Rangeview Lake by ADFG and it is uncertain whether they gained access to Rangeview Lake through migration or were placed into the lake by anglers fishing in other Coal Mine Road area lakes. Unlike most other Coal Mine Road area lakes, survival of Arctic char from stocking to age 1 has remained relatively constant through the duration of this experimental stocking program. Mean lengths of age 1 Arctic char in 1988, 1989, and 1990 were 163, 97, and 185 mm, respectively. The single species stockings of Arctic char into Rangeview Lake in 1987, 1988, and 1989 were all fully successful. It is uncertain why the 1988 stocking produced age 1 fish that were below the minimum criteria of 100 mm.

Dick's Pond:

Dick's Pond is located south of Delta Junction along the Coal Mine Road. The pond is 2.0 ha in surface area and has a maximum depth of 7.3 m (Table 42). Arctic char were stocked into Dick's Pond from 1987 through 1989. Sampling in 1988, 1989, and 1990 revealed that 900, 893, and 33 Arctic char were residing in Dick's Pond in those years, respectively. As in other nearby lakes, survival rate of Arctic char from stocking to age 1 has been decreasing. Mean lengths of age 1 Arctic char in 1988, 1989, and 1990 were 170, 123, and 143 mm, respectively. The single species stocking of Arctic char into Dick's Pond in 1987 and 1988 were judged fully successful, whereas, the 1989 stocking was judged to have been only moderately successful (density = 2 age 1 Arctic char per ha in 1990).

Jan Lake:

Jan Lake is 17.8 ha in surface area and has a maximum depth of 14.0 m (Table 43). The lake is located east of Delta Junction and can be accessed by a gravel road that intersects the Alaska Highway at Mile Post 1,353.5. Jan Lake was first stocked in 1966 with rainbow trout fingerlings and has since been stocked with fingerling rainbow trout in 1969, 1971, 1973, 1976, and 1985 through 1989. Coho salmon were stocked in Jan Lake in 1968, 1972, 1974, 1979, and 1990. Jan Lake has no endemic species of fish. In 1987, sampling revealed that there were 4,655 rainbow trout residing in Jan Lake. The single species stocking of rainbow trout into Jan Lake in 1986 was fully successful

Table 41. Rangeview Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 242, Coal Mine Road Mile Post 2.7
Access status:	Road
Endemic species:	None
Stocked species:	Arctic char
Other species:	Arctic grayling and lake trout
Surface area:	1.8 ha
Maximum depth:	2.7 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1987	Arctic char	Aleknagik	Jun 18	900	Fingerling	4.33	1986
1988	Arctic char	Aleknagik	Jun 28	900	Fingerling	4.22	1987
1989	Arctic char	Aleknagik	Jul 19	315	Subcatch.	20.00	1988

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1988										
1987	Arctic char	1	337	(47)	185	(26)	163	(4)	37	(1)
1989										
1988	Arctic char	1	373	(201)	205	(110)	97	(2)	41	(2)
1987	Arctic char	2	405	(300)	222	(165)	198	(2)		
1990										
1989	Arctic char	1	113	(39)	62	(22)	185	(2)	36	(2)
	Arctic char	2+	129	(60)	71	(33)	236	(2)		
	Arctic grayling[a]	2+	5				214	(35)		
	Lake trout[b]	1	0							
	Lake trout[b]	2+	1				193			

[a] There is no record of Arctic grayling stocked in Rangeview Lake.
[b] There is no record of lake trout stocked in Rangeview Lake.

Table 42. Dick's Pond: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Richardson Highway Mile Post 242, Coal Mine Road Mile Post 4.1
Access status:	Road
Endemic species:	Slimy sculpin
Stocked species:	Arctic char
Surface area:	2.0 ha
Maximum depth:	7.3 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1987	Arctic char	Aleknagik	Jun 18	1,000	Fingerling	4.33	1986
1988	Arctic char	Aleknagik	Jun 28	1,000	Fingerling	4.22	1987
1989	Arctic char	Aleknagik	Jul 19	200	Subcatch.	20.00	1988

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1988										
1987	Arctic char	1	900	(80)	445	(40)	170	(2)	90	(1)
1989										
1988	Arctic char	1	406	(292)	201	(144)	123	(6)	41	(2)
1987	Arctic char	2	487	(466)	241	(230)	212	(5)		
1990										
1989	Arctic char	1	4	(2)	2	(1)	143	(12)	2	(1)
	Arctic char	2+	29	(2)	14	(1)	200	(4)		

Table 43. Jan Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Alaska Highway Mile Post 1,353.5
Access status:	Road
Endemic species:	None
Stocked species:	Rainbow trout, coho salmon
Surface area:	17.8 ha
Maximum depth:	14.0 m
Alkalinity:	42 mg/L as $CaCO^3$

Part II. Stocking History

			Specifics concerning stocking cohort			
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1966	Rainbow trout	Winthrop	Aug 2	3,000	Fingerling	1.13	1966
1968	Coho salmon	Lake Rose	Jul 8	8,000	Fingerling	0.74	1967
1969	Rainbow trout	Winthrop	Jul 31	20,000	Fingerling	1.02	1969
1971	Rainbow trout	Ennis	Jun 24	19,400	Fingerling	1.99	1971
1972	Coho salmon	Delta/Clr R	Aug 29	9,000	Fingerling	1.87	1971
1973	Rainbow trout	Ennis	Jul 18	8,200	Fingerling	8.40	1973
1974	Coho salmon	Delta/Clr R	Jul 23	4,300	Fingerling	2.06	1973
1976	Rainbow trout	Williamette	Aug 2	10,000	Fingerling	0.68	1976
1979	Coho salmon	Seward Lgn	Sep 18	4,010	Fingerling	8.37	1978
1985	Rainbow trout	Swanson R	Aug 27	8,800	Fingerling	1.77	1985
1986	Rainbow trout	Swanson R	Aug 18	8,800	Fingerling	1.32	1986
1987	Rainbow trout	Swanson R	Aug 24	8,800	Fingerling	1.87	1987
1988	Rainbow trout	Swanson R	Aug 15	8,800	Fingerling	1.15	1988
1989	Rainbow trout	Swanson R	Aug 7	8,800	Fingerling	1.20	1989
1990	Coho salmon	Big Lake	Jul 16	8,800	Fingerling	2.70	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance (SE)	Density in fish per hectare (SE)	Mean length in mm (SE)	Percent survival to age 1 (SE)
1987						
1986	Rainbow trout	1	3,957 (462)	222 (26)	120 (1)	45 (17)
	Rainbow trout	2+	698 (211)	39 (12)	153 (1)	

with a resultant density of stocked age 1 game fish estimated at 222 fish per ha. Age 1 rainbow trout had a mean length of 120 mm in 1987. Anglers reported that adequately dense populations of rainbow trout resided in Jan Lake from 1988 through 1990, and based on these reports, it is assumed that the 1987 through 1989 rainbow trout fingerling stocking program has also been successful although the level of success is unquantifiable.

Robertson Lake Number 2:

Robertson Lake Number 2 is located east of Delta Junction. The lake is accessible by a 0.5 km trail that starts from Mile Post 1,348 of the Alaska Highway. The lake has a surface area of 6.1 ha and a maximum depth of 4.9 m (Table 44). Robertson Lake Number 2 was first stocked in 1971 with rainbow trout fingerlings. Since 1971, the lake has been stocked with fingerling rainbow trout in 1973, 1979, 1983, 1985, 1986, and 1988. The lake has no endemic fish species. In 1987, 684 rainbow trout were estimated to have been residing in the lake, and the density of age 1 rainbow trout was estimated to have been 69 fish per ha. Mean length of age 1 rainbow trout in 1987 was 111 mm. The single species stocking of rainbow trout into Robertson Lake Number 2 in 1986 was fully successful. Anglers reported that an adequately dense population of rainbow trout resided in Robertson Lake Number 2 in 1989, and based on these reports, it is assumed that the 1988 rainbow trout fingerling stocking was successful although, as in Jan Lake, the level of success is unquantifiable.

Echo Lake:

Echo Lake is located near Palmer and is accessible from the Glenn Highway at Mile Post 37.3. The lake has a surface area of 9.2 ha and a maximum depth of 12.2 m (Table 45). Echo lake was first stocked with coho salmon in 1968. For brevity, only the stocking history of Echo Lake since 1984 is further discussed in this text. Coho salmon were stocked from 1984 through 1990. Chinook salmon were stocked in 1984 and 1985. Rainbow trout were stocked in 1986, 1989, and 1990. Havens (1988) conducted an evaluation of the stockings of game fish into lakes and ponds of the Matanuska and Susitna valleys and pertinent data from those evaluations related to the resultant age 1 game fish population in Echo Lake are provided in Table 45. The age 1 game fish population in Echo Lake in 1987 was composed of 601 coho salmon and 279 rainbow trout. Mean length of age 1 coho salmon and rainbow trout in 1987 was 185 and 165 mm, respectively. The mixed species stocking of coho salmon and rainbow trout into Echo Lake in 1986 was judged fully successful and species diversity criteria were fully achieved.

Wolf Lake:

Wolf Lake is located near Palmer and is accessible from Brigstrom Road at Mile 2. The lake has a surface area of 24.8 ha and a maximum depth of 5.2 m (Table 46). Wolf Lake was first stocked with coho salmon in 1984. Coho salmon were again stocked from 1986 through 1990. Arctic grayling were stocked in 1985 and 1986. Rainbow trout were stocked in 1990. Data collected by Havens (1988) related to the age 1 game fish population in Wolf Lake are provided in Table 46. In 1987, the age 1 game fish population in Wolf Lake

Table 44. Robertson Lake Number 2: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Alaska Highway Mile 1,348
Access status:	Road/trail
Endemic species:	None
Stocked species:	Rainbow trout
Surface area:	6.1 ha
Maximum depth:	4.9 m

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1971	Rainbow trout	Ennis	Jun 24	3,100	Fingerling	1.99	1971
1973	Rainbow trout	Winthrop	Jul 18	3,000	Fingerling	3.07	1973
1979	Rainbow trout	Talarik Cr	Sep 18	1,029	Fingerling	2.24	1979
1983	Rainbow trout	Swanson R	Sep 14	1,435	Fingerling	1.55	1983
1985	Rainbow trout	Swanson R	Aug 27	2,000	Fingerling	1.77	1985
1986	Rainbow trout	Swanson R	Oct 8	3,000	Fingerling	1.32	1986
1988	Rainbow trout	Swanson R	Aug 15	1,600	Fingerling	1.15	1988

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Rainbow trout	1	417	(30)	69	(5)	111	(1)	5	(33)
	Rainbow trout	2+	267	(31)	44	(5)	196	(4)		

Table 45. Echo Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Glenn Highway Mile 37.3
Access status:	Road, trail
Endemic species:	Three spine stickleback
Stocked species:	Coho salmon, rainbow trout, chinook salmon
Surface area:	9.2 ha
Volume:	581,530 m^3
Maximum depth:	12.2 m
Mean depth:	5.9 m
Alkalinity:	137 mg/L as $CaCO^3$
Morphoedaphic index:	19.43

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1966	Rainbow trout	Winthrop	Aug 15	9,200	Fingerling	1.01	1966
1968	Coho salmon	Bear Ck	Jun 20	3,500	Fry	0.44	1967
1968	Rainbow trout	Winthrop	Jun 20	3,500	Fry	0.27	1968
1971	Coho salmon	Lake Miam	Jun 21	9,198	Fingerling	1.18	1970
1972	Coho salmon	Ship Cr	Jun 8	7,400	Fingerling	2.93	1971
1972	Coho salmon	Ship Cr	Aug 3	1,700	Fingerling	2.56	1971
1973	Coho salmon	Lk Rose Tead	Aug 9	9,200	Fingerling	2.78	1972
1974	Coho salmon	Crooked Cr	Jul 9	6,900	Fingerling	1.97	1973
1975	Coho salmon	Bear L	Jul 22	4,600	Fingerling	1.55	1974
1977	Rainbow trout	Williamette	May 6	1,250	Catchable	79.58	1976
1977	Rainbow trout	Ennis	Jul 18	9,200	Fingerling	2.04	1977
1978	Rainbow trout	Swanson R	Sep 12	4,600	Fingerling	1.60	1978
1979	Coho salmon	Seward Lgn	Sep 19	4,606	Fingerling	7.71	1978
1980	Rainbow trout	Swanson R	Aug 19	4,600	Fingerling	0.92	1980
1981	Coho salmon	Seward Lgn	Jun 4	4,600	Smolts	17.37	1980
1982	Coho salmon	Bear Ck	May 21	4,600	Fingerling	0.15	1981
1983	Coho salmon	Crooked Cr	Jun 8	7,000	Fingerling	0.64	1982
1984	Chinook salmon	Crooked Ck	May 23	2,310	Fingerling	2.00	1983
1984	Coho salmon	Seward Lgn	May 21	2,302	Fingerling	1.62	1983
1985	Chinook salmon	Crooked Ck	May 17	2,300	Fingerling	7.37	1984
1985	Coho salmon	Crooked Cr	May 17	2,300	Fingerling	2.79	1984
1986	Coho salmon	Crooked Cr	May 23	4,609	Fingerling	3.54	1985
1986	Rainbow trout	Swanson R	Aug 27	2,300	Fingerling	2.96	1986
1987	Coho salmon	Crooked Cr	Jun 29	4,600	Fingerling	1.04	1986
1988	Coho salmon	L Susitna R	Jun 7	4,600	Fingerling	3.70	1987
1989	Coho salmon	Bear L	May 9	4,596	Fingerling	4.70	1988
1989	Rainbow trout	Swanson R	Aug 24	1,736	Catchable	141.00	1988
1990	Coho salmon	Bear L	May 9	4,600	Fingerling	3.00	1989
1990	Rainbow trout	Swanson R	Jun 1	1,946	Catchable	97.10	1989

-continued-

Table 45. (Page 2 of 2).

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Coho salmon	1	601	(13)	65	(1)	185	(1)	15	(<1)
1986	Rainbow trout	1	279	(12)	30	(1)	165	(2)	12	(<1)

Table 46. Wolf Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Mile Post 2 Brigstrom Road, Palmer
Access status:	Road, trail
Endemic species:	Three spine stickleback
Stocked species:	Coho salmon, rainbow trout, Arctic grayling
Surface area:	24.8 ha
Volume:	551,470 m^3
Maximum depth:	5.2 m
Mean depth:	2.1 m
Alkalinity:	101 mg/L as $CaCO^3$
Morphoedaphic index:	39.71

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1984	Coho salmon	Seward Lgn	May 31	13,275	Fingerling	1.86	1983
1985	Arctic grayling	Jack L	Sep 3	12,400	Fingerling	1.24	1985
1986	Coho salmon	Crooked Ck	Jun 25	11,020	Fingerling	1.38	1985
1986	Arctic grayling	Moose L	Sep 8	12,400	Fingerling	4.60	1986
1987	Coho salmon	Crooked Ck	Jun 29	12,400	Fingerling	1.04	1986
1988	Coho salmon	Susitna R	Jul 5	12,400	Fingerling	1.26	1987
1989	Coho salmon	Bear L	May 11	12,735	Fingerling	4.90	1988
1990	Coho salmon	Bear L	May 10	13,650	Fingerling	3.00	1989
1990	Rainbow trout	Swanson R	Jul 20	6,200	Fingerling	1.40	1990

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance	(SE)	Density in fish per hectare	(SE)	Mean length in mm	(SE)	Percent survival to age 1	(SE)
1987										
1986	Coho salmon	1	1,095	(10)	49	(<1)	161	(1)	10	(<1)
1986	Arctic grayling	1	266	(3)	12	(<1)	134	(2)	3	(<1)

was estimated to have been composed of 1,095 coho salmon with a mean length of 161 mm, and 266 Arctic grayling with a mean length of 134 mm. The mixed species stocking of Arctic grayling and coho salmon in 1986 was judged to have been fully successful and species diversity criteria were achieved.

Slipper Lake:

Slipper Lake is located near Sutton and is accessible from the Jonesville Road. The lake has a surface area of 3.6 ha and a maximum depth of 6.1 m (Table 47). Slipper Lake was first stocked in 1982 with rainbow trout. Since then, rainbow trout were stocked in 1983, 1986, 1987, 1989, and 1990. Arctic grayling were stocked in 1986 and 1987. Information pertinent to the age 1 game fish population of Slipper Lake are provided in Table 47 (Havens 1988). Abundance of the age 1 game fish populations of Slipper Lake in 1987 was estimated to have been composed of 112 rainbow trout and 18 Arctic grayling. Mean lengths of age 1 rainbow trout and Arctic grayling in 1987 were 261 and 256 mm, respectively. The mixed species stocking of Arctic grayling and rainbow trout into Slipper lake in 1986 was judged to have been only moderately successful based upon the estimated density of only 5 age 1 game fish per ha. However, species diversity criteria were achieved.

Achievement of Pre-Established Criteria by Single and Mixed Species Stockings

A total of 52 single species stockings were evaluated against two pre-established fishery management criteria to judge success of these stocking endeavors. Fourteen of the 52 single species stockings (27%) were determined to have failed to provide an adequately dense population of age 1 game fish because the resultant density from these stockings was below two fish per ha (Table 48). Only three of the stockings (6%) were classified as moderately successful with the remaining 35 stockings (67%) judged to have been fully successful because they each produced a density of at least 20 game fish per ha. In only two of 37 cases (5%) was the minimum length requirement for age 1 fish not achieved when density was judged as moderately successful or fully successful.

A total of 61 mixed species stockings were evaluated against three pre-established fishery management criteria. Fourteen of the 61 mixed species stockings (23%) failed to result in age 1 game fish populations with a density of at least two fish per ha (Table 48). Ten of the 61 mixed species stockings (16%) resulted in age 1 populations of game fish that were determined to have been of moderate density. Of these 10 moderately dense game fish populations, all met the minimum length requirement for age 1 game fish however, the species diversity criteria for each species component of the population was only fully achieved in five cases (50%). Thirty-seven of the 61 mixed species stockings (61%) were judged fully successful from a fish density standpoint because they all resulted in game fish populations that exceeded the level of 20 age 1 fish per ha. Only two of these 37 fully successful mixed species stockings (5%) resulted in age 1 game fish that failed to meet the minimum mean length criteria of 100 mm. However, only 14 of these 37 mixed species stockings (39%) fully achieved the third criteria of species diversity, wherein each component species represented at least 10% of the age 1 game fish population.

Table 47. Slipper Lake: lake specifics, stocking history, and recent fishery statistics.

Part I. Lake Specifics

Characteristic	Specifics
Location:	Jonesville Road,
Access status:	Road
Endemic species:	None
Stocked species:	Arctic grayling, rainbow trout
Surface area:	3.6 ha
Volume:	111,080 m^3
Maximum depth:	6.1 m
Mean depth:	2.8 m
Alkalinity:	308 mg/L as $CaCO^3$
Morphoedaphic index:	110

Part II. Stocking History

			Specifics concerning stocking cohort				
Year	Species	Brood Stock	Date	Number	Life Stage	Mean Weight (g)	Brood Year
1986	Arctic grayling	Moose Cr	Sep 22	970	Fingerling	6.38	1986
1986	Arctic grayling	Moose Cr	Sep 22	1,030	Fingerling	6.38	1986
1987	Arctic grayling	Moose L	Aug 21	1,580	Fingerling	3.73	1987
1982	Rainbow trout	Swanson R	Sep 2	2,700	Fingerling	1.44	1982
1983	Rainbow trout	Swanson R	Sep 12	1,820	Fingerling	1.18	1983
1986	Rainbow trout	Swanson R	Sep 10	1,800	Fingerling	2.34	1986
1987	Rainbow trout	Swanson R	Aug 3	1,800	Fingerling	1.92	1987
1989	Rainbow trout	Swanson R	Jun 14	592	Catchable	76.00	1988
1990	Rainbow trout	Swanson R	Jun 1	588	Catchable	100.00	1989

Part III. Recent Fishery Statistics

Sampling Year / Brood Year	Species	Age	Abundance (SE)	Density in fish per hectare (SE)	Mean length in mm (SE)	Percent survival to age 1 (SE)
1987						
1986	Rainbow trout	1	112 (6)	4 (<1)	261 (5)	6 (<1)
1986	Arctic grayling	1	18 (1)	1 (<1)	256 (7)	1 (<1)

Table 48. Overall success, growth rate, and diversity resulting from single species and mixed species stockings of game fish into 47 small lakes, ponds, and gravel pits.

Part I. Evaluation by Water Body

Water Body	Stocking Year	Species Stocked[a]	Evaluation of Stocking Cohorts		
			Overall Success	Growth Rate	Diversity
Steese-29.5	1986	AG	Full Success	Adequate	N.A.
Steese-29.5	1987	AG	Full Success	Adequate	N.A.
Steese-29.5	1988	AG/LT	Full Success	Adequate	Inadequate
Steese-29.5	1989	AG/LT	Full Success	Adequate	Inadequate
Steese-30.6	1986	AG	Moderate Success	Adequate	N.A.
Steese-30.6	1987	AG	Full Success	Adequate	N.A.
Steese-30.6	1988	AC/AG	Full Success	Adequate	Inadequate
Steese-30.6	1989	AC/AG	Full Success	Adequate	Adequate
Steese-31.6	1985	AG	Full Success	Adequate	N.A.
Steese-31.6	1987	AG	Full Success	Adequate	N.A.
Steese-33.0	1987	AG	Full Success	Adequate	N.A.
Steese-33.0	1988	AG	Full Success	Adequate	N.A.
Steese-33.0	1989	AG	Full Success	Adequate	N.A.
Steese-33.5	1987	AG	Full Success	Adequate	N.A.
Steese-33.5	1988	AG	Failure	N.A.	N.A.
Steese-33.5	1989	AG	Full Success	Adequate	N.A.
Steese-34.6	1987	AG	Full Success	Adequate	N.A.
Steese-34.6	1988	AG/LT	Failure	N.A.	N.A.
Steese-34.6	1989	AG/LT	Full Success	Adequate	Inadequate
Steese-35.8	1986	AG	Failure	N.A.	N.A.
Steese-35.8	1987	AG	Full Success	Adequate	N.A.
Steese-35.8	1988	AG	Failure	N.A.	N.A.
Steese-35.8	1989	AG	Full Success	Adequate	N.A.
Steese-36.6	1986	AG	Full Success	Adequate	N.A.
Steese-36.6	1987	AG	Full Success	Adequate	N.A.
Steese-36.6	1988	AC	Failure	N.A.	N.A.
Steese-36.6	1989	AC/AG	Moderate Success	Adequate	Inadequate
Steese-39.3	1989	RT	Full Success	Adequate	N.A.
CHSR-32.9	1987	AG	Full Success	Adequate	N.A.
CHSR-32.9	1988	AC/AG	Failure	N.A.	N.A.
CHSR-32.9	1989	AC/AG	Full Success	Adequate	Inadequate

-continued-

Table 48. (Page 2 of 5).

Water Body	Stocking Year	Species Stocked[a]	Evaluation of Stocking Cohorts: Overall Success	Growth Rate	Diversity
CHSR-42.8	1986	AG	Failure	N.A.	N.A.
CHSR-42.8	1987	AG	Failure	N.A.	N.A.
CHSR-45.5	1986	AG/RT	Full Success	Adequate	Adequate
CHSR-45.5	1987	AG/RT	Full Success	Inadequate	Adequate
CHSR-45.5	1988	AG	Full Success	Adequate	Adequate
CHSR-45.5	1989	AG/RT	Full Success	Adequate	Adequate
CHSR-47.9	1986	AG	Failure	N.A.	N.A.
CHSR-47.9	1987	AG	Full Success	Inadequate	N.A.
CHSR-47.9	1988	AG/LT	Moderate Success	Adequate	Inadequate
CHSR-47.9	1989	AG/LT	Full Success	Adequate	Inadequate
Bathing Beauty Pond	1986	AG/RT	Full Success	Adequate	Adequate
Bathing Beauty Pond	1987	AG/RT	Full Success	Adequate	Adequate
Bathing Beauty Pond	1988	AC/AG/LT/RT	Full Success	Adequate	Inadequate
Bathing Beauty Pond	1989	AC/LT/RT	Full Success	Adequate	Inadequate
Grayling Lake	1986	AG/RT	Failure	N.A.	N.A.
Grayling Lake	1987	AG/RT	Failure	N.A.	N.A.
Grayling Lake	1988	AC/LT/RT	Failure	N.A.	N.A.
Grayling Lake	1989	AC/AG/LT/RT	Failure	N.A.	N.A.
Hidden Lake	1988	AC/AG	Moderate Success	Adequate	Adequate
Hidden Lake	1989	AC/AG/LT/RT	Failure	N.A.	N.A.
28 Mile Pit	1988	AC/SS	Full Success	Adequate	Inadequate
28 Mile Pit	1989	AC/SS/RT	Full Success	Adequate	Inadequate
31 Mile Pit	1988	AC/SS/RT	Moderate Success	Adequate	Inadequate
31 Mile Pit	1989	AC/SS/RT	Failure	N.A.	N.A.
Johnson No. 1	1986	SS/RT	Failure	N.A.	N.A.
Johnson No. 1	1987	AG/SS/RT	Failure	N.A.	N.A.
Johnson No. 1	1988	AG/SS/RT	Failure	N.A.	N.A.
Johnson No. 1	1989	AG/SS/RT	Full Success	Adequate	Inadequate
Little Harding Lake	1988	AC/KS/RT	Full Success	Adequate	Inadequate
Little Harding Lake	1989	AC/RT	Failure	N.A.	N.A.
Lost Lake	1988	AC/LT/SS/RT	Moderate Success	Adequate	Inadequate
Lost Lake	1989	AC/LT/SS/RT	Moderate Success	Adequate	Inadequate

-continued-

Table 48. (Page 3 of 5).

Water Body	Stocking Year	Species Stocked[a]	Evaluation of Stocking Cohorts		
			Overall Success	Growth Rate	Diversity
Silver Fox Lake	1988	LT	Failure	N.A.	N.A.
Silver Fox Lake	1989	LT	Failure	N.A.	N.A.
Nickel Lake	1988	LT/RT	Full Success	Adequate	Inadequate
Nickel Lake	1989	LT/RT	Full Success	Adequate	Adequate
Rock Hound Lake	1988	LT/RT	Full Success	Adequate	Inadequate
No Mercy Lake	1989	LT/RT	Full Success	Adequate	Inadequate
Doc Lake	1988	AC/RT	Full Success	Adequate	Inadequate
Doc Lake	1989	AC/RT	Full Success	Adequate	Inadequate
Chet Lake	1988	LT/RT	Full Success	Adequate	Inadequate
Chet Lake	1989	LT/RT	Full Success	Adequate	Inadequate
Luke Lake	1987	AG	Full Success	Adequate	N.A.
Luke Lake	1988	AC/AG	Failure	N.A.	N.A.
Luke Lake	1989	RT	Failure	N.A.	N.A.
Sheefish Lake	1988	AG/LT	Moderate Success	Adequate	Adequate
Sheefish Lake	1989	LT	Failure	N.A.	N.A.
Bullwinkle Lake	1988	RT	Failure	N.A.	N.A.
Bullwinkle Lake	1989	LT/RT	Moderate Success	Adequate	Adequate
Ghost Lake	1988	LT/RT	Full Success	Adequate	Inadequate
Ghost Lake	1989	LT/RT	Moderate Success	Adequate	Adequate
Bolio Lake	1988	AG/KS/LT	Failure	N.A.	N.A.
Bolio Lake	1989	AG	Failure	N.A.	N.A.
North Twin Lake	1986	RT	Full Success	Adequate	N.A.
South Twin Lake	1986	RT	Full Success	Adequate	N.A.
Coal Mine Number 5	1988	LT	Full Success	Adequate	N.A.
Coal Mine Number 5	1989	LT/RT	Full Success	Adequate	Adequate
Ken's Pond	1987	AC/RT	Full Success	Adequate	Inadequate
Ken's Pond	1988	AC/RT	Full Success	Adequate	Adequate
Ken's Pond	1989	AC/RT	Full Success	Adequate	Inadequate

-continued-

Table 48. (Page 4 of 5).

Water Body	Stocking Year	Species Stocked[a]	Evaluation of Stocking Cohorts		
			Overall Success	Growth Rate	Diversity
Backdown Lake	1987	AC/RT	Full Success	Adequate	Adequate
Backdown Lake	1988	AC/RT	Full Success	Adequate	Adequate
Backdown Lake	1989	AC/RT	Full Success	Adequate	Adequate
Brodie Lake	1987	AC	Full Success	Adequate	N.A.
Brodie Lake	1988	AC	Full Success	Adequate	N.A.
Brodie Lake	1989	AC	Moderate Success	Adequate	N.A.
Last Lake	1987	AC	Full Success	Adequate	N.A.
Last Lake	1988	AC	Full Success	Adequate	N.A.
Last Lake	1989	AC	Failure	N.A.	N.A.
Paul's Pond	1988	LT	Full Success	Adequate	N.A.
Paul's Pond	1989	LT/RT	Full Success	Adequate	Inadequate
Rangeview Lake	1987	AC	Full Success	Adequate	N.A.
Rangeview Lake	1988	AC	Full Success	Inadequate	N.A.
Rangeview Lake	1989	AC	Full Success	Adequate	N.A.
Dick's Pond	1987	AC	Full Success	Adequate	N.A.
Dick's Pond	1988	AC	Full Success	Adequate	N.A.
Dick's Pond	1989	AC	Moderate Success	Adequate	N.A.
Jan Lake	1986	RT	Full Success	Adequate	N.A.
Robertson Number 2	1986	RT	Full Success	Adequate	N.A.
Echo Lake	1986	SS/RT	Full Success	Adequate	Adequate
Wolf Lake	1986	AG/SS	Full Success	Adequate	Adequate
Slipper Lake	1986	AG/RT	Moderate Success	Adequate	Adequate

[a] Species are as follows: AC = Arctic char, AG = Arctic grayling, KS = chinook salmon, LT = lake trout, SS = coho salmon, and RT = rainbow trout.

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Table 48. (Page 5 of 5).

Part II. Stocking Evaluation Summary

Stocking Strategy	Density (age 1)	Growth	Diversity	No. of Stockings
Single Species	Failures			14
	Moderate Success	Adequate	N.A.	3
	Moderate Success	Inadequate	N.A.	0
	Full Success	Adequate		33
	Full Success	Inadequate		2
			Subtotal:	52
Mixed Species	Failures			14
	Moderate Success	Adequate	Adequate	5
	Moderate Success	Adequate	Inadequate	5
	Moderate Success	Inadequate	Adequate	0
	Moderate Success	Inadequate	Inadequate	0
	Full Success	Adequate	Adequate	12
	Full Success	Adequate	Inadequate	23
	Full Success	Inadequate	Adequate	2
	Full Success	Inadequate	Inadequate	0
			Subtotal:	61
Total Stocking Evaluations				113

Part III. Mixed Species Combinations That Met Moderate or Fully Successful Density Criteria and That Met Species Diversity Criteria.

Species Combination	Stocking Evaluations That Met Criteria		
	Number	Proportion	Percent
Arctic char & Arctic grayling	2	2 of 7	29%
Arctic char & rainbow trout	4	4 of 9	44%
Arctic grayling & coho salmon	1	1 of 1	100%
Arctic grayling & lake trout	1	1 of 7	14%
Arctic grayling & rainbow trout	6	6 of 8	75%
Coho salmon & rainbow trout	1	1 of 2	50%
Lake trout & rainbow trout	4	4 of 11	36%
All Mixed Species Evaluations	19	19 of 45	42%

In no cases where three or four species were stocked in combination (n = 15), were fishery management criteria achieved, whereas, the only two species stocking combination that completely failed was the combination of Arctic char and coho salmon, and that specific combination was only evaluated once (Table 48). This result for a sub-Arctic area complements the recommendation made by Nilsson (1967) for temperate waters. It may well be that "diffuse competition" as described by MacArthur (1972) is responsible for the failure of three and four species stockings. Based upon this result, it is recommended that no more than two species of game fish be stocked annually in small lakes, ponds, and gravel pits of interior Alaska. If fishery managers require further species diversity in specific small lakes, ponds, or gravel pits, this needed diversity should be attempted by stocking the third or fourth species in different years, and even then, the manager should not be surprised if failure results.

Nineteen of the 61 mixed species stockings (31%) met the combined criteria of resulting in a moderately successful or fully successful density (more than two age 1 game fish per ha) and resulted in populations wherein each species stocked represented at least 10% of the age 1 game fish population (Table 48). All of these 19 moderately or fully successful stockings that achieved diversity criteria were double species stockings. The species combinations that met this combined criteria were: (1) Arctic char stocked in combination with Arctic grayling; (2) Arctic char stocked in combination with rainbow trout; (3) Arctic grayling stocked in combination with coho salmon; (4) Arctic grayling stocked in combination with lake trout; (5) Arctic grayling stocked in combination with rainbow trout; (6) coho salmon stocked in combination with rainbow trout; and (7) lake trout stocked in combination with rainbow trout. Although the stocking of Arctic grayling in combination with coho salmon met these criteria, the combination was only evaluated once. The stocking combination of coho salmon and rainbow trout which has proved successful in large lakes of the Tanana Valley was only evaluated twice in small lakes and it met these criteria 50% of the time. The other five potentially successful double species stocking combinations were evaluated from seven to 11 times each (Table 48). Of these five, the most promising double species stocking combination was Arctic grayling and rainbow trout (75% successful). The double species stocking combinations of Arctic char and rainbow trout (44% successful), lake trout and rainbow trout (36% successful), and Arctic char and Arctic grayling (29% successful) also show some promise for future mixed species stockings of small lakes, ponds, and gravel pits. The combination of stocking Arctic grayling and lake trout was evaluated seven times and success was only achieved once (14%), indicating that this specific double species combination has a low probability of success if used in future mixed species stocking endeavors.

Densities of Age 1 Fish Achieved by Single and Mixed Species Stockings

Comparisons of the proportions of the age 1 game fish populations with low, middle, and high densities resulting from the stocking of lakes, ponds, and gravel pits with single versus mixed species (Tables 49 and 50) were not significantly different for either the single species and overall mixed species comparison ($P = 0.44$) nor the single species and double species

Table 49. Ranking (age 1 fish/ha) of single species stockings.

Water Body	Stocking Year	Species Stocked[a]	Density of Stocked Game Fish at Age 1 (fish/ha)	Rank
Steese-33.5	1988	AG	0	1
Steese-35.8	1986	AG	0	2
Steese-35.8	1988	AG	0	3
Steese-36.6	1988	AC	0	4
CHSR-42.8	1986	AG	0	5
CHSR-42.8	1987	AG	0	6
CHSR-47.9	1986	AG	0	7
Silver Fox Lake	1988	LT	0	8
Silver Fox Lake	1989	LT	0	9
Luke Lake	1989	RT	0	10
Bullwinkle Lake	1988	RT	0	11
Last Lake	1989	AC	0	12
Sheefish Lake	1989	LT	1	13
				25th Percentile
Bolio Lake	1989	AG	1	14
Dick's Pond	1989	AC	2	15
Brodie Lake	1989	AC	9	16
Steese-30.6	1986	AG	10	17
Coal Mine Number 5	1988	LT	20	18
Steese-33.5	1989	AG	32	19
Steese-29.5	1987	AG	36	20
Steese-31.6	1987	AG	51	21
Rangeview Lake	1989	AC	62	22
Robertson Number 2	1986	RT	69	23
Last Lake	1988	AC	71	24
Steese-36.6	1987	AG	74	25
Steese-35.8	1989	AG	76	26
CHSR-47.9	1987	AG	81	27
CHSR-45.5	1988	AG	110	28
Luke Lake	1987	AG	118	29
Brodie Lake	1988	AC	120	30
Steese-33.0	1989	AG	131	31
Last Lake	1987	AC	139	32
Steese-33.0	1988	AG	148	33
Steese-36.6	1986	AG	176	34
Rangeview Lake	1987	AC	185	35
Steese-34.6	1987	AG	200	36
Dick's Pond	1988	AC	201	37
Rangeview Lake	1988	AC	205	38
North Twin Lake	1986	RT	206	39
				75th Percentile
Jan Lake	1986	RT	222	40
Paul's Pond	1988	LT	225	41

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Table 49. (Page 2 of 2).

Water Body	Stocking Year	Species Stocked[a]	Density of Stocked Game Fish at Age 1 (fish/ha)	Rank
CHSR-32.9	1987	AG	249	42
Brodie Lake	1987	AC	295	43
Steese-29.5	1986	AG	360	44
Steese-31.6	1985	AG	368	45
Steese-33.5	1987	AG	388	46
South Twin Lake	1986	RT	410	47
Dick's Pond	1987	AC	445	48
Steese-35.8	1987	AG	493	49
Steese-30.6	1987	AG	496	50
Steese-33.0	1987	AG	523	51
Steese-39.3	1989	RT	730	52

[a] Species are as follows: AC = Arctic char, AG = Arctic grayling, LT = lake trout, and RT = rainbow trout.

Table 50. Ranking (age 1 fish/ha) of mixed species stockings.

Water Body	Stocking Year	Species Stocked[a]	Density of Stocked Game Fish at Age 1 (fish/ha)	Rank
Steese-34.6	1988	AG/LT	0	1
CHSR-32.9	1988	AC/AG	0	2
Grayling Lake	1986	AG/RT	0	3
Grayling Lake	1987	AG/RT	0	4
Grayling Lake	1988	AC/LT/RT	0	5
Grayling Lake	1989	AC/AG/LT/RT	0	6
Hidden Lake	1989	AC/AG/LT/RT	0	7
31 Mile Pit	1989	AC/SS/RT	0	8
Johnson No. 1	1986	SS/RT	0	9
Johnson No. 1	1987	AG/SS/RT	0	10
Johnson No. 1	1988	AG/SS/RT	0	11
Little Harding Lake	1989	AC/RT	0	12
Luke Lake	1988	AC/AG	0	13
Bolio Lake	1988	AG/KS/LT	0	14
			Low-Middle Density Delineation	
31 Mile Pit	1988	AC/SS/RT	4	15
Lost Lake	1988	AC/LT/SS/RT	4	16
Bullwinkle Lake	1989	LT/RT	4	17
Slipper Lake	1986	AG/RT	5	18
Lost Lake	1989	AC/LT/SS/RT	6	19
CHSR-47.9	1988	AG/LT	8	20
Steese-36.6	1989	AC/AG	9	21
Sheefish Lake	1988	AG/LT	12	22
Ghost Lake	1989	LT/RT	15	23
Bathing Beauty Pond	1989	AC/LT/RT	23	24
Hidden Lake	1988	AC/AG	23	25
Rock Hound Lake	1988	LT/RT	23	26
Steese-29.5	1988	AG/LT	24	27
28 Mile Pit	1988	AC/SS	24	28
Ghost Lake	1988	LT/RT	26	29
Steese-29.5	1989	AG/LT	28	30
Backdown Lake	1989	AC/RT	31	31
Steese-30.6	1988	AC/AG	42	32
Doc Lake	1988	AC/RT	49	33
Little Harding Lake	1988	AC/KS/RT	59	34
Paul's Pond	1989	LT/RT	60	35
Wolf Lake	1986	AG/SS	61	36
Steese-34.6	1989	AG/LT	62	37
CHSR-47.9	1989	AG/LT	64	38
Coal Mine Number 5	1989	LT/RT	65	39
Nickel Lake	1989	LT/RT	70	40
CHSR-32.9	1989	AC/AG	74	41
Bathing Beauty Pond	1988	AC/AG/LT/RT	88	42
Echo Lake	1986	SS/RT	95	43

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Table 50. (Page 2 of 2).

Water Body	Stocking Year	Species Stocked[a]	Density of Stocked Game Fish at Age 1 (fish/ha)	Rank
No Mercy Lake	1989	LT/RT	105	44
Chet Lake	1989	LT/RT	127	45
Doc Lake	1989	AC/RT	131	46
Bathing Beauty Pond	1987	AG/RT	154	47
Johnson No. 1	1989	AG/SS/RT	185	48
CHSR-45.5	1987	AG/RT	186	49
Ken's Pond	1987	AC/RT	195	50
Bathing Beauty Pond	1986	AG/RT	213	51
			Middle-High Density Delineation	
Backdown Lake	1988	AC/RT	218	52
Nickel Lake	1988	LT/RT	255	53
Backdown Lake	1987	AC/RT	265	54
28 Mile Pit	1989	AC/SS/RT	266	55
CHSR-45.5	1989	AG/RT	290	56
Ken's Pond	1989	AC/RT	291	57
Chet Lake	1988	LT/RT	297	58
Ken's Pond	1988	AC/RT	337	59
Steese-30.6	1989	AC/AG	378	60
CHSR-45.5	1986	AG/RT	661	61

[a] Species are as follows: AC = Arctic char, AG = Arctic grayling, KS = chinook salmon, LT = lake trout, SS = coho salmon, and RT = rainbow trout.

(Table 51) comparison (P = 0.29). This result indicates that the resultant total numbers of age 1 stocked game fish in these small lakes, ponds, and gravel pits were similar whether single or mixed species stocking occurred.

Angler Surveys

For Bathing Beauty Pond, Little Harding Lake, Lost Lake, and Nickel Lake stockings did not meet the established criteria yet angler surveys indicate that stocked fish were harvested (Appendix A). Although anglers did report catching fish in these lakes and harvest estimates were made, it is not possible from the angler survey to distinguish fish used in this study from previously stocked fish. Fish used in this study were identified by age as determined through length frequency analysis. The angler survey did not ask for length information. Harvest estimates for these lakes were not reported in the State Wide Angler Survey (Mills 1989, 1990) because the small number of respondents (five or less) yield variances that are too large to be useful.

CONCLUSIONS

It is concluded that the stocking of mixed species of game fish in small lakes, ponds, and gravel pits of interior Alaska has the advantage of increasing species diversity but not the advantage of increased production that often accompanies sympatric stocking. Further, it is concluded that this advantage in species diversity can be obtained through the stocking of several different combinations of two game fish species and that the stocking of three or four species in combination is less likely to result in species diversity success than the stocking of a double species combination.

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Table 51. Ranking (age 1 fish/ha) of double species stockings.

Water Body	Stocking Year	Species Stocked[a]	Density of Stocked Game Fish at Age 1 (fish/ha)	Rank
Steese-34.6	1988	AG/LT	0	1
CHSR-32.9	1988	AC/AG	0	2
Grayling Lake	1986	AG/RT	0	3
Grayling Lake	1987	AG/RT	0	4
Johnson No. 1	1986	SS/RT	0	5
Little Harding Lake	1989	AC/RT	0	6
Luke Lake	1988	AC/AG	0	7
			Low-Middle Density Delineation	
Bullwinkle Lake	1989	LT/RT	4	8
Slipper Lake	1986	AG/RT	5	9
CHSR-47.9	1988	AG/LT	8	10
Steese-36.6	1989	AC/AG	9	11
Sheefish Lake	1988	AG/LT	12	12
Ghost Lake	1989	LT/RT	15	13
Hidden Lake	1988	AC/AG	23	14
Rock Hound Lake	1988	LT/RT	23	15
Steese-29.5	1988	AG/LT	24	16
28 Mile Pit	1988	AC/SS	24	17
Ghost Lake	1988	LT/RT	26	18
Steese-29.5	1989	AG/LT	28	19
Backdown Lake	1989	AC/RT	31	20
Steese-30.6	1988	AC/AG	42	21
Doc Lake	1988	AC/RT	49	22
Paul's Pond	1989	LT/RT	60	23
Wolf Lake	1986	AG/SS	61	24
Steese-34.6	1989	AG/LT	62	25
CHSR-47.9	1989	AG/LT	64	26
Coal Mine Number 5	1989	LT/RT	65	27
Nickel Lake	1989	LT/RT	70	28
CHSR-32.9	1989	AC/AG	74	29
Echo Lake	1986	SS/RT	95	30
No Mercy Lake	1989	LT/RT	105	31
Chet Lake	1989	LT/RT	127	32
Doc Lake	1989	AC/RT	131	33
Bathing Beauty Pond	1987	AG/RT	154	34
CHSR-45.5	1987	AG/RT	186	35
Ken's Pond	1987	AC/RT	195	36
Bathing Beauty Pond	1986	AG/RT	213	37
			Middle-High Density Delineation	
Backdown Lake	1988	AC/RT	218	38
Nickel Lake	1988	LT/RT	255	39
Backdown Lake	1987	AC/RT	265	40
CHSR-45.5	1989	AG/RT	290	41
Ken's Pond	1989	AC/RT	291	42

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Table 51. (Page 2 of 2).

Water Body	Stocking Year	Species Stocked[a]	Density of Stocked Game Fish at Age 1 (fish/ha)	Rank
Chet Lake	1988	LT/RT	297	43
Ken's Pond	1988	AC/RT	337	44
Steese-30.6	1989	AC/AG	378	45
CHSR-45.5	1986	AG/RT	661	46

[a] Species are as follows: AC = Arctic char, AG = Arctic grayling, LT = lake trout, SS = coho salmon, and RT = rainbow trout.

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APPENDIX A

Appendix A. Harvest estimates from angler surveys.[a]

Harvest Year	Lake	Rainbow Trout	Lake Trout	Arctic Char	Arctic Grayling	Respondents
1989	Bathing Beauty Pond	43			150	3
	Little Harding Lake	43		11		2
	Lost Lake		33		20	1
	Nickel Lake	793			541	5

[a] Mills, Mike. 1989. Personal Communication. ADFG, 333 Raspberry Rd., Anchorage, Alaska 99518.